A NATURAL HISTORY OF THE DUCKS

IN FOUR VOLUMES

VOLUME III

RED-HEADS COMING IN

A NATURAL HISTORY OF THE DUCKS

BY

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WITH PLATES IN COLOR AND IN BLACK AND WHITE
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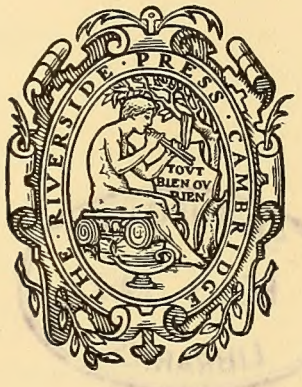
VOLUME III

ANATINÆ (CONCLUDED) AND FULIGULINÆ (IN PART)



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A NATURAL HISTORY OF THE DUCKS

SUBFAMILY ANATINÆ *(concluded)*

MARBLED DUCK

ANAS ANGUSTIROSTRIS MÉNÉTRIÉS

(Plate 46)

SYNONYMY

Anas angustirostris Ménétriés, Cat. raisonné des Objects de Zool. recueillis dans un Voy. au Caucase, p. 58, 1832.

Anas marmorata Gould, Proc. Zool. Soc. London, 1836, p. 59.

Dafila marmorata Eyton, Monograph Anatidæ, p. 114, 1838.

Querquedula angustirostris Bonaparte, Comparative List, p. 57, 1838.

Marmaronetta angustirostris Reichenbach, Avium Systema Naturæ, p. ix, 1852.

?*Anas cypria* Unger and Kotschy, Die Insel Cypern, 1865.

Marmonetta angustirostris von Martens, Journ. f. Ornith., vol. 16, p. 67, 1868.

Chaulelasmus (*Marmonetta*) *angustirostris* G. R. Gray, Handlist, vol. 3, p. 84, 1871.

Querquedula marmorata Dresser, Proc. Zool. Soc. London, 1872, p. 605.

Chauliodes angustirostris Radde, Ornis Caucas., p. 455, 1884.

Marmaronetta marmorata Blasius, Verein f. Naturw., Braunschweig, Tagebl., 14 Mch. 1894.

VERNACULAR NAMES

English: Marbled Duck.

German: Marmel-Ente, Marmor-Ente, Schmalschnäblige Schnatterente.

French: Canard marbré, Sarcelle angustirostre, Sarcelle marbrée.

Italian: Garganella marmorata, Anatra marmorizzata.

Spanish: Cerceta jaspeada, Roseta, Bubilla, Pato de verano, Ruhilla, Pardilla.

Portuguese: Pardilheira.

Moorish: Chihil.

Maltese: Brajmla ghedduma rkik.

Greek: Papero psaro.

Hungarian: Marvanyos recze.

Russian: Letnaya utka, Akordeg.

DESCRIPTION

ADULT MALE: General coloration very light gray, more or less mottled. The head is pale gray except a patch around the eye which is dark brown. The cheeks, chin and throat are nearly white, streaked with light brown. Mantle and scapulars light brown, but the tips of the feathers nearly white. Rump grayish, tail-feathers gray, except the tips, which are white. Under parts grayish white, mottled and barred on the breast, flanks, and under tail-coverts, and nearly uniform in the middle of the abdomen. Wing almost plain gray and without a speculum, although the secondaries are somewhat lighter in color. Under wing-coverts mostly white.

Iris brown. Bill bluish gray, black on the culmen and tip. Legs and feet horny brown, with webs black (Salvadori, 1895).

Wing 205 mm.; bill 45; tarsus 37 (Museum of Comparative Zoölogy specimens).

Adult Female: Similar to the male but slightly smaller.

Young in Down: Not seen.

DISTRIBUTION

The Marbled Duck has a unique range among the ducks. It is confined to the warmer regions of southern Europe, northern Africa, and southwestern Asia, and is essentially resident, though in Europe at least it is known primarily as an irregular summer visitor. What appear to have been migratory movements of considerable numbers have been observed in the Suez Canal region.

In the west it is found as far south as the Cape Verde Islands, where it breeds on Boavista (Barboza de Bocage, 1898; B. Alexander, 1898; Meinertzhagen, *in litt.*). It is not a well-known bird in the Canaries, but has been reported as breeding in the group (Bolle, 1857; Cabrera y Díaz, 1893–94; Bannerman, 1919). In the Madeiras a specimen was shot on July 29, 1894, near Funchal (Hartwig, 1894). It is perhaps most common as a breeding bird in northern Africa. In Morocco it is a well-known species and a common breeder (Irby, 1875; Vaucher, 1915), and in Algeria also a considerable number nest, especially on Lake Fetzara, where countless numbers breed (Zedlitz, 1914). In Tunis it seems to be somewhat rarer, but is nevertheless known as a breeding bird (Talamon, 1904; J. I. S. Whitaker, 1905; Millet-Horsin, 1912). Von Heuglin (1873) took a specimen in the Ben-Ghazi district of Tripoli. It is a not uncommon species in Egypt, and is known to have bred in Lower Egypt on the Wadi Natrun and as far as Fayûm (Cecil, 1904; Nicoll, 1919; Lord William Percy, *in litt.*).

Northern Africa

As stated above, the Marbled Duck is only an irregular migrant and summer resident in southern and central Europe. In Portugal it is a very rare bird (A. C. Smith, 1868). It has been recorded from Guadiana, Ribatejo and Silves (Oliveira, *fide* de Seabra, 1910); and Tait (1887) thinks it may possibly breed in the northern parts. It is a far more common bird in Spain, that is, in the southern parts, but even there its numbers vary greatly in different years. Usually they appear in Andalucia and Valencia in spring, and in some seasons great numbers nest, especially along the lower Guadalquivir. There is no evidence of any wintering in Spain, but the species has been taken as far north as Gerona (Irby, 1875; H. Saunders, 1871; Reyes y Prosper, 1886; Arévalo y Baca, 1887; H. Noble, 1902; A. Chapman and Buck, 1910).

Portugal Spain

Its occurrence in France is wholly accidental. A specimen was taken in Bresse in 1872, and two were captured in Saône-et-Loire in 1893 (*fide* Paris, 1907). There seems to have been a flight near St. Gilles (departement Gard) in the springs of 1886, 1897 and 1898, as various specimens were killed there (Anfrie, 1913; Hugues, 1913). L'Hermitte (1916) says the species is of accidental occurrence in Camargue. In Switzerland a specimen is said to have been shot near Geneva during the last decade of the last century (Fatio, 1904). There is, so far as I know, only one record for Germany, and that is of a pair shot near Wasserburg, Bavaria, late in June, 1892 (von Besserer, Ornith. Jahrb., 1894, p. 215). It is possible that these birds may have bred in the north, and that the Geneva specimen was taken in that year, for on June 16, 1892, a flock of about fifty appeared near Lucca, Italy. They re-appeared in August, about seventy in number, and were shot at various places in northern and central Italy during the remainder of 1892 and the greater part of 1893 (Picchi, 1904; Arrigoni degli Oddi, 1904). Another specimen was taken late in August, 1897, near Molinella (Cavazza, 1912) and in May, 1903, a specimen was taken near Foggia (Angelini, *fide* Arrigoni degli Oddi, 1904). Three specimens are said to have been taken near Naples in 1858 and a flight is said to have occurred in Sicily in 1881 (Picchi, 1904). The only speci-

France Germany Italy

DSI

MARBLED DUCK

men known from Malta is that recorded by C. A. Wright (1864). So far as I know there is only one record for Sardinia, and that is of three specimens taken there in 1839 (Picchi, 1904). The only record for Corsica refers to a specimen found in the Ajaccio market by Parrot (1910).

The flight of 1892 reached Czecho-Slovakia and Hungary in considerable numbers. On July 25 and 26, 1892, four specimens were taken in the former country, near Frauenburg (Riha, 1892), another specimen was taken near Kladno in January, 1893 (*fide* Naumann, 1896–1905). A female was taken on Lake Velencze, Hungary, on August 1, 1893 (von Besserer, Ornith. Jahrb., 1894, p. 216) and others at the same place on September 15, 1894 (Lendl, 1895), September 5, 1895, and September 26, 1896. Very likely a few birds had become resident on Lake Velencze. Chernel (*fide* Naumann, 1896–1905) saw fifteen to twenty specimens there in September, 1896. A specimen was also taken (July, 1893) near Gardony, central western Hungary (Rosonowsky, 1893).

Czecho-Slovakia

In the Balkans three specimens of the Marbled Duck were taken on May 28, 1889, at Ostrozac on the Narenta (Reiser, 1890). Elwes and Buckley (1870) met with it in Albania, and both Lord Lilford and Powys (1860) have recorded it from Butrinto and Phanari in western Greece. The northernmost record for the species is for Lake Ilmen, Russia, where a specimen is reputed to have been taken (Severtzoff, *fide* Poliakoff, 1909). In southern Russia specimens have been taken about Astracan and Lenkoran (Radde, 1884). Seebohm (1882, 1883) considers it a rare resident and breeder about Astracan and throughout the Caucasus. It seems to be a rare resident on Cyprus (Meinertzhagen, *in litt.*).

Balkans
Russia

The Marbled Duck breeds in Palestine and may breed in Syria, Asia Minor and northern Arabia (Juaf oasis) but our information on these regions is very inadequate. Tristram (1884) found them in great numbers throughout the year in the swamps of the Huleh, Palestine; and the British Museum has several specimens from the Euphrates Valley. According to a member of the British Expeditionary Force (T. R. L., 1918) a few were seen on the lower Euphrates in February and March, and some breed there. Since then it has been recorded as a common breeder along the Tigris and Euphrates River (Ticehurst, Buxton and Cheesman, 1922). In Persia the species is quite common, wintering on the littoral of the Persian Gulf and Arabian Sea, and breeding on the south coast of the Caspian, in the Parapamis, the Seistan region, and farther east and south (Radde, 1886; Zarudny, 1911; Baker, 1919). Stantschinsky (1914) found it common in Transcaucasia. In Transcaspia a few winter, but it is described by various writers as the commonest nesting duck in the basin of the Amur Daria, and about Merv (Zarudny, 1889–90; Radde and Walter, 1889; Stolzmann, 1893; Loudon, 1910; Molčanov, 1912). Specimens have frequently been taken in Afghanistan, some being winter records, and one at least a summer occurrence (C. Swinhoe, 1882; Scully, 1887; Sharpe, 1889; O. B. St. John, 1889). Here it is an irregular summer visitor and breeder, but only a few winter (Zarudny, 1911; Aitken, 1914; Ludlow, 1916; Meinertzhagen, 1920).

Palestine
Arabia
Transcaspia

Many of the summer birds of Persia, Afghanistan and Baluchistan undoubtedly go south in winter to northwestern India, for the species is extremely common in winter in Sind, and extends as far as northern Guzerat and Cutch, straggling down the Ganges Valley, where a number of specimens have been taken in the United Provinces, about Delhi and Lucknow; and it has several times been found in the Calcutta Market (Hume and Marshall, 1879; Jesse, 1903; Baker, 1908). A friend of Baker's asserts that he has shot two specimens as far east as Gowhatty, Assam.

India

Mention should be made of the fact that the British Museum has a specimen collected in the Seychelles!

GENERAL HABITS

THE systematic position of this duck has long been a puzzle to ornithologists, who, at one time or another have placed it with the Mallard-like ducks, the Blue-winged Teals, the Pintails, and the Gadwall. There is nothing in its anatomy or in its habits

to justify making a separate genus for it, unless indeed, we are to place every well-marked species of duck in a genus by itself. Superficially the only remarkable character in the Marbled Duck is the absence of the speculum. But very noteworthy is its peculiar distribution, which extends from west to east covering a very narrow belt, hardly exceeding the Mediterranean subregion. It evidently has little in common with other palæarctic ducks.

Hume and Marshall (1879) speak of the Marbled Duck as "poor" and rather "sluggish," "very much disposed to take life easy, and in a *dolce far niente* style; and lacking in every line the vigour and energy that characterize races born and bred within the hardy north." It certainly seems to be of a retiring nature, preferring thickly covered to open waters, and spending much of its time in the rushes. It is essentially a fresh-water duck, but during migration has been seen on the sea (Irby, 1875).

Wariness. As noted before, the Marbled Duck is a rather sluggish bird, and most observers have found it moderately tame, often allowing a boat to push within gunshot through the rushes. In the breeding season it appears to be *very* tame, and when one of the pair is killed the other will return. In the autumn they unite into larger flocks and are then much more difficult to approach (Zarudny, 1889–90; H. Noble, 1902). When not too hard hunted, Hume and Marshall (1879) found them acting like Coots, concealing themselves in the rushes, and only reluctantly taking wing. Tristram (1884), however, found them very wild and wary in northern Palestine in June, and Irby (1875) and J. I. S. Whitaker (1905) speak of them as shy and difficult to approach in Spain and Tunis.

Gait, Swimming and Diving. These ducks do not dive except when wounded, and even then they show no particular agility (Hume and Marshall, 1879).

Flight. "The flight of this species," says Hume (Hume and Marshall, 1879), "though teal-like, is less rapid and flexible (if I may coin an expression to represent the extreme facility with which that species turns and twists in the air) than that of the Common Teal. It more nearly resembles that of the Garganey, but is less powerful, and less rapid even than that of this latter species. There is something of the Gadwall in it, but it wants the ease of this. It flies much lower too, and, as already mentioned, much more readily resettles after being disturbed." Irby (1875) likens the flight to that of the female Pintail, and Zarudny (1889–90) says it reminded him of the Gadwall. Others speak of it as fast and rapid, but there is evidently nothing very characteristic about it.

In the cool season these ducks are gregarious and unite in flocks numbering sometimes hundreds (Irby, 1875; Hume and Marshall, 1879).

MAP 66. Distribution of Marbled Duck (*Anas angustirostris*)
Sporadic records indicated by crosses (×)

Association with other Species. No observers, so far as I know, have noted any sociable tendencies in this duck. No doubt in the wintering areas of North Africa and northwestern India they are to be found in the same resorts as those of other water-fowl, and Hume and Marshall (1879) speak of Shovellers or White-eyed Pochard getting up from the same lagoon.

Voice. Few writers have distinguished the notes of the two sexes. The low croaking whistle mentioned by Lord Lilford is unquestionably the call of the male, while the distinct, rather hoarse *quack* heard by Hume (Hume and Marshall, 1879) is almost certainly the note of the female. In respect to voice the species seems to be very similar to the Teals.

The trachea, according to Favier (in Dresser, 1871–81) is somewhat narrower at the extremities than in the middle part, and the *bulla ossea* is left-sided, bony, and about the size of a cherry.

Food. No careful analysis of stomach contents has been made, but from the statements of most writers it seems that the food is the same as that of other shoal-water ducks. Still, I think this species must be dependent on minute animal food, for it does poorly in captivity. Favier noticed that in Tangiers they fed chiefly on winged insects (*Myrmelion*) and Loche (1867) found them in Algeria feeding on crustaceans, insects, and worms. In India Hume and Marshall (1879) state that the diet includes leaves, shoots, rootlets, corms, and seeds of aquatic plants, intermingled with worms, fresh-water shells, insects of all kinds and their larvæ.

Courtship and Nesting. The display of the Marbled Duck has never been adequately described. Zarudny (1889–90) noted that when about to fly, the birds lower the neck and raise the head, and that this movement is rare, excepting during courtship. This seems to indicate that the courtship is a very simple affair, but Finn (1915) says that when displaying, the male "jerks back his head on to his shoulders."

Considering the fact that many of these birds are sedentary in a warm climate and that none travels more than a short distance to the breeding grounds, the nesting season is extraordinarily late. In the Canaries young have been taken in May (1858) but in Spain, Morocco, and Algeria nests are rarely found before the middle of May or beginning of June (Favier, *fide* Irby, 1875; H. Noble, 1902; Zedlitz, 1914b). In Cyprus nests have been taken on May 24 (Baxendale, 1915), and a clutch of seven highly incubated eggs as late as July 5 (Bucknill, 1911). In Transcaspia, where the species breeds in great numbers, the laying season is very irregular. In early July some young were already on the wing, while others were only just hatched (Zarudny, 1889–90). The dates for Mesopotamia are for May and June. In

Baluchistan, at an elevation of 5000 feet, a female and fourteen ducklings were seen in August (Aitken, 1914).

The nest itself presents no peculiarities. It is usually placed in a clump of rushes, or on the flat shore, ordinarily close to the water, though some have been found as much as 700 feet, or even two or three kilometers from the water (Zarudny, 1889–90; Zedlitz, 1914). A. Chapman and Buck (1910) say the nests are well concealed, and some are approached by a sort of tunnel. In exceptional cases they found the nest built a foot high in the branches of a samphire bush with a little clear space beneath, and overhanging shallow water. Along the Euphrates the birds seemed to prefer dry situations not far from the river. I cannot help thinking that Seebohm's (1882) statement, that in Astrakan, hollow trees and old crows' nests are used, must apply to some other species.

The clutch is quite variable, numbering from seven to twelve (Zarudny, 1889–90), or even fifteen (H. Noble, 1902). The average is ten or eleven. According to Irby (1875) the eggs resemble those of the Common Teal. They are pale to reddish cream in color, measuring from 42.4–50.6 by 31.5–36.0 mm.; the average of fifty-seven eggs was 46.2 by 33.9 mm. (Hartert, 1920a). The incubation period varies from twenty-five to twenty-seven days (Favier, *fide* Irby, 1875). During incubation the males flock together and pay no attention to the family when the young are hatched (Zarudny, 1889–90).

Status. The irregularity in occurrence of this species is one of its peculiarities, and makes it almost impossible to give any definite statement in regard to its abundance. In Morocco and Algeria it is certainly one of the most plentiful species (Irby, 1875; Zedlitz, 1914) and even in winter it is exceeded only by the Common Teal in Tangiers (Favier, *fide* Irby, 1875). A. Chapman and Buck (1910) consider it one of the most abundant breeding ducks along the marshes of the Guadalquivir, but there, as elsewhere, it is irregular in occurrence (H. Noble, 1902). According to Loche (1867) there had been a great decrease in Algeria since the time of the French occupation (1839–40). In Transcaspia it is easily the commonest nesting duck. On the overflowed meadows of the Alikhanow Canal an "immense number of nests" were found (Zarudny, 1889–90). In northwestern India it arrives in large numbers to pass the winter (Hume and Marshall, 1879). In a recent letter to me Colonel Meinertzhagen described a large flight which visited Kantara (Suez Canal) on the 18th and 19th of April, 1920. Whence they came or whither they were bound, appeared to him a mystery.

Enemies. Nothing recorded.

Damage. Probably very slight.

Food Value. Irby (1875) considered these birds "excellent eating," but other, perhaps more discriminating, writers are of a different opinion. A. Chapman and Buck (1910) consider them very bad eating, and Hume (Hume and Marshall, 1879), is by no means enthusiastic about them. The species, he says, "is not amongst first class ducks for the table. It ranks, I should say, little above the Shoveller and the White-eyed Pochard, and after obtaining a goodly array of specimens, we never shot it — first class ducks, Gadwall, Mallard and Pintail as well as the Pochard (*Fuligula ferina*) and Common Teal being always available."

Behavior in Captivity. Marbled Ducks have very seldom been kept alive in collections, and seem to be ill-adapted to life in artificial surroundings. Lord Lilford kept a large number, some of which found their way eventually into the collection of the Duke of Bedford, where they bred (Hubbard, 1907). In 1893, Lord Lilford presented the London Gardens with four specimens, but these, and others acquired later, did not do well, living on an average only eighteen months, the maximum being eight years and seven months (P. C. Mitchell, 1911). Mr. Blaauw writes me that he, too, obtained specimens from Lord Lilford, but they did not breed, and after a year or so all six were killed by a stoat. Specimens have also been kept in the Berlin Gardens (Müller-Liebenwalde, 1894). They have never been imported into America.

SHOVELLER

SPATULA CLYPEATA (LINNÉ)

(Plate 47)

SYNONYMY

Anas clypeata Linné, Systema Naturæ, ed. 10, vol. 1, p. 124, 1758.

Anas rufigaster Latham, General Synopsis Birds, Suppl., vol. 1, p. 297, 1787.

Anas mexicana Gmelin, Linné's Systema Naturæ, ed. 13, vol. 1, pt. 2, p. 519, 1789.

Anas rubens Gmelin, Linné's Systema Naturæ, ed. 13, vol. 1, pt. 2, p. 519, 1789.

Anas clypeata-mexicana, Bonnaterre, Encyclop. Méthodique, Ornith., vol. 1, p. 151, 1791.

Spatula clypeata Boie, Oken's Isis, 1822, p. 564.

Rhynchaspis clypeata Stephens, General Zool., vol. 12, pt. 2, p. 115, pl. 48, 1824.

Rhynchaspis mexicana Stephens, General Zool., vol. 12, pt. 2, p. 118, 1824.

Clypeata macrorhynchos Brehm, Oken's Isis, 1830, p. 997.

Clypeata platyrhynchos Brehm, Oken's Isis, 1830, p. 997.

Clypeata pomarina Brehm, Oken's Isis, 1830, p. 997.

Clypeata brachyrhynchos Brehm, Oken's Isis, 1830, p. 997.

Rhynchaspis virescens Sykes, Proc. Zool. Soc. London, 1832, p. 168.

Rhynchaspis macrorhynchos Brehm, Vogelfang, p. 377, 1855.

Rhynchaspis platyrhynchos Brehm, Vogelfang, p. 378, 1855.

Rhynchaspis pomarina Brehm, Naumannia, 1855, p. 298.

Rhynchaspis brachyrhynchos Brehm, Naumannia, 1855, p. 298.

Rhynchaspis platyuros Brehm, Naumannia, 1855, p. 298.

Rhynchaspis clypeata a. *mexicana* Bonaparte, Compt. Rend. Acad. Sci. Paris, vol. 43, p. 650, 1856.

Rhynchaspis spathulata C. F. Dubois, Planch. Col. Oiseaux Belg., vol. 3, p. 276, 1860.

Rhynchasmus clypeata König, Journ. f. Ornith., vol. 41, p. 104, 1893.

Spatula clypeata indiana Mathews, List Birds Australia, p. 92, 1913.

VERNACULAR NAMES

English: Shoveller, Spoonbill, Broadbill, Blue-wing Shoveller, Mud Duck, Red-breasted Shoveller, Shovel-bill, Cowan, Cow-frog, Swaddle-bill, Shovelard, Maiden Duck, Sheldrake, Whinyard, Rattle-wing, Britannia.

German: Löffelente, Spatelente, Schildente, Schellente, Schallente, Moosente, Moorente, Fliegenente, Mückenente, Breitschnabel, Räschenkopf, Taschenmaul, Leppelschnute, Fasanente, Sloppen.

SHOVELLER

Immature Male

Juvenal Male

Adult Female

Adult Male

Adult Female

French: Le souchet, Bec plat, Canard spatule, Bec en cuiller, Louchard, Rouge de rivière, Rouget, Barbelle, Bec de spatule, Mesquin.
Italian: Mestolone, Fistione, Spatola, Beccociatto, Cuzzorott, Palott, Fafen, Cucchiarone, Biccangia.
Spanish: Pato cucharetero, Pato sardinero, Pato cuchara, Pato paleto, Bragat, Cullerot, Rastella, Bech d'espatula, Anech paletar, Cuchareta, Utegastia or Ata-golharia (*Basque*).
Portuguese: Pato trombeteiro, Colhereira, Pintalhão.
Dutch: Slobeend, Slobbe, Leppelbek.
Norwegian: Skeand, Skovand.
Swedish: Skedand, Leffeland.
Danish: Skeand, Skjoldnaeb, Krapand, Slopand.
Icelandic: Skeidönd.
Finnish: Lapasorsa.
Esthonian: Luitso nok.
Lettish: Platknahbis.
Polish: Kaczka plaskonos.
Russian: Soksun, Shirokonoska, Plutonos, Luponossaja.
Hungarian: Kanalas récze.
Czech: Lžičák.
Ostiak: Logali.
Samoyed: Saau-tula.
Mongolian: Galbun.
Korean: Ualpiguli.
Kamchatkan: Tcheptchinu.
Eskimos of Alaska: Yu-gok-puk.
Creoles of Louisiana: Micoine.
Mexican: Tempatlahoac, Yacapatlahoac.
Hawaii: Northwest Duck.
Croatian: Patka kašikara.
Maltese: Palettuna.
Arabic: Bat.
India: (*Hindustani*), Tidari, Punana, Tokurwalla, Ghirah; (*Nepalese*), Dhobaha, Khikeria Sankhar; (*Sindhi*), Alipat; (*Bengali*), Puntamukhi.

DESCRIPTION

Adult Male: Head and upper part of neck dark, glossy, metallic green. A dark-brown area extends down middle of mantle, leaving the lower neck, sides of breast and sides of mantle pure white. The dark-brown area includes also the central scapulars, the back and the rump, although the latter is glossed with green reflections. The outer scapulars are pure white except the posterior long ones, which are pale blue on the outer web. The longest scapulars are black with prominent central white

shaft stripes. Central tail-feathers dark brown, outer ones nearly white. Whole lower surface except lower neck and breast, chestnut color, richer on the flanks. Under tail-coverts black, sides of rump white. Outer wing-coverts pale blue; lower row black with white tips, forming an anterior speculum bar. Speculum, on the outer web of the secondaries, glossy green. Primaries dark brown; under wing-coverts and axillars white.

Iris golden to reddish orange. Bill dark lead-color to blackish. Legs and feet bright orange-red.

Wing 228–250 mm.; tarsus 35–40; culmen 61–68 (Museum of Comparative Zoölogy specimens).

Weight 1 pound, 4 ounces to 1 pound, 10 or 12 ounces (0.56 to 0.79 kilograms).

Adult Female: A plain brown-colored duck with general coloration very similar to that of the female Mallard. The wing plan is similar to that of the male Shoveller but the blue of the wing-coverts is only just perceptible, and the speculum is dull-colored except on the innermost secondaries.

Iris yellow. Bill greenish brown with the margins of the culmen yellower. Lower mandible dull orange. Legs and feet nearly as in the male.

Wing 230–240 mm.; tarsus 37; culmen 60–64.

Weight 1 pound, 2 ounces to 1 pound, 4 ounces (0.51 to 0.56 kilograms), possibly more.

Male in Eclipse: This plumage is assumed rather late in the summer and carried into the winter as with the Blue-winged Teal. The general appearance is very much like that of the female. The occiput is darker than in the adult female and the mantle is more uniform, without the broad light edgings to the feathers.

Although as a general rule the old males do not attain winter plumage until later than most ducks, one does see some in nearly perfect feather by the first week in December.

Young Female in First Plumage: Closely resembles adult female but can be distinguished by the more uniform appearance of mantle and scapular region (lack of light edgings to the feathers). The lower surface is darker and more streaked and spotted with gray, especially the lower abdomen. The tail-feathers are blunted at the tips as in the young of other species.

Young Male in First Plumage: Similar to the female at corresponding age except for the bluer wing-coverts and brighter green on the speculum. Sometimes a few feathers bearing broad subterminal blackish bands appear on the breast in September, and these are the beginning of the change to adult plumage. During October young males with ruddy coloring and irregular cross-barring on the abdomen begin to appear, and later on changes to adult plumage begin on the head, mantle and breast.

Young in Down: Almost exactly like the young of the Mallard. The bill is not markedly spatulate, but the edges of the upper mandible are soft, and the developing bristles can be made out.

DISTRIBUTION

Though by no means so common a bird as a number of other shoal-water ducks, the Shoveller has a range exceeding in extent that of any other member of the family. It has never been met with on the

America

Alaska

Aleutian Islands, but a specimen was taken on May 24, 1910, on St. Paul Island in the Pribilof group (Evermann, 1913) and it occurs in Alaska. A specimen has been recorded from Nushagak, at the base of the Alaska Peninsula (Osgood, 1904) and along the coast of the Bering Sea it breeds, though not commonly, from the mouth of the Kuskoquim as far north as Kotzebue Sound, and is rather common along the Yukon (Nelson, 1887). Dall and Bannister (1869) state that it appears frequently at St. Michael's, but E. Adams (1878) took only a single pair at Michaelaski.

MAP 67. Distribution

Breeding range, dotted
Sporadic records

Shoveller (*Spatula clypeata*)

e; winter range, broken line
licated by crosses (×)

MAP 67. Distribution of Shoveller (*Spatula clypeata*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

Farther east the species is said to have bred along the Yukon (Baird, Brewer and Ridgway, 1884) and it has been met with rarely on the lower MacKenzie, at Fort Good Hope, Fort Simpson and even on the Anderson River (R. MacFarlane, 1908; Preble, 1908). Stefánsson was told that six specimens had been shot at the mouth of the Horton River. But the species probably does not go regularly north of the Great Slave Lake — Fort Rae and Fort Resolution (Baird, Brewer and Ridgway, 1884) — or even Lake Athabasca where small numbers are found in the Athabasca delta near Fort Chipewyan (Frank Russell, 1898; Harper, MS.). In the southern parts of western Canada it is a regular breeding species. Though rare on Vancouver Island it is a common bird in southern British Columbia, along the lower Fraser and at Okanagan Lake (Brooks, *fide* Kermode, 1904), but it is a scarce breeder in the Cariboo district (A. Brooks, 1903). In northern Alberta, Spreadborough (*fide* J. and J. M. Macoun, 1909) met with it everywhere between Lesser Slave Lake and Peace River Landing, while Seton (1911) found it along the Athabasca. Preble (1908) speaks of it as fairly common in this region and lists a number of localities where it was found. Farther south it has been found breeding at Buffalo Lake, Banff and Lake Ste. Anne (J. and J. M. Macoun, 1909) and in eastern Alberta it is an abundant breeder (W. S. Brooks and Cobb, 1911). In the northern parts of Saskatchewan it is probably rare, but Buchanan (1920) found it numerous along the Churchill River and R. MacFarlane (1908) has recorded it from Moose Lake and Cumberland House. It is a common breeding bird on Crane Lake (J. and J. M. Macoun, 1909) and nests plentifully in southwestern Saskatchewan (Bent, 1907; Ferry, 1910; and others). In Manitoba also it is an abundant breeder from Lake Winnipeg west (E. E. Thompson, 1891; Taverner, 1919) but the range does not extend into the Keewatin region, though specimens have been taken at Trout Lake and even at Moose Factory (Preble, 1902).

Canada

In the United States the Shoveller breeds not uncommonly in Washington, east of the Cascades (W. L. Dawson and Bowles, 1909) and in eastern Oregon (Pope, 1895–96). A small number nest in California, chiefly in the north, and sporadically as far south as Los Angeles County (Grinnell, Bryant and Storer, 1918). It is known to have nested in a number of localities in Montana where on the plains it is a common nesting species (A. A. Saunders, 1921; and others) and it does so in Idaho, where it is a fairly common bird (Rust, 1915; U.S. Biological Survey records). Hoffman (1881) states that it was common at Pyramid Lake, Nevada, in May; G. G. Cantwell (U.S. Biological Survey) reported it breeding on the Oregon bird reserves, and Wetmore (1921) found it a rather plentiful breeding bird on the Bear River marshes, Utah. Mearns (1890) met with the species in May and June in the Mogollon Mountains, Arizona, and it seems reasonable to suppose that it breeds there, for at Lake Burford, New Mexico, Wetmore (1920) found a small number nesting. This duck breeds regularly in suitable localities in Colorado (W. L. Sclater, 1912) and is a fairly common breeder in Wyoming (W. C. Knight, 1902; Grave and Walker, 1913). In North Dakota it is an abundant nesting bird (Bent, 1901–02) and in South Dakota it breeds regularly in some localities (McChesney, 1879; Visher, 1909, 1913). Oberholser (1920) found it breeding in great numbers in the sandhill district of western Nebraska, but in Kansas it is a rare bird in summer (Goss, 1891; Bunker, 1913). There are breeding records for St. Paul and a few points in southern Minnesota (Hatch, 1892; U.S. Biological Survey), but though some of the birds spend the summer in northern Iowa, there is no good breeding record for that State (R. M. Anderson, 1907). On the other hand there is a record of Shovellers having nested in Clark County, Missouri (Widmann, 1907). According to Kumlien and Hollister (1903) the species is common and nests all over Wisconsin, but Woodruff (1907) speaks of it as a very rare bird in summer about Chicago, Illinois. It is known to have nested in northwestern Indiana (English Lake) and there are a number of other summer records (A. W. Butler, 1898). I do not find a specific breeding record for Michigan, but Cooke (1906) states that the Shoveller nests rarely in the southern part of that State.

United States

East of the Mississippi the Shoveller is, on the whole, a rare breeder, the records for localities east of Michigan being quite exceptional. There are a few localities on the Canadian side of Lake Erie where

isolated pairs have nested — Long Point, Dunnville, Hamilton (Cooke, 1906; U.S. Biological Survey) — and a specimen has been taken near Quebec as late as May 31 (Mousley, 1921). The southern limit of the breeding range is not wholly clear. Audubon's statement that he found the Shoveller nesting near Galveston, Texas, might have been thought unusual until members of the U.S. Biological Survey came across a female with her brood near East Bernard and then found the species breeding near Brownsville (Gaut; Lloyd, U.S. Biological Survey). Whether any of these ducks breed in western Texas it is impossible at present to say, but Strecker's (1912) statement that they nest all over Texas certainly requires further evidence. Even in Mexico, near Chihuahua and at the tip of Lower California, specimens have been found in the nesting season (Cooke, 1906). Reports of breeding at Lake Chapala, Jalisco, Mexico (Nordhoff, 1922) require further confirmation.

Europe

British Isles

In the Old World as in the New, the Shoveller is one of the more southerly breeders. In the British Isles it has been increasing as a breeding bird and has been extending its range during the last fifty years. It now nests in many localities in Scotland, the northernmost records being for the Hebrides and the Orkneys (Rintoul and Baxter, 1920a). It also nests in a number of counties in England, but more rarely in the west and in Wales, than on the North Sea side (H. Saunders, 1899; Millais, 1902; Stonham, 1908; and others). In Ireland it breeds in all provinces and in most counties (Ussher and Warren, 1900).

Western Europe

On the Continent a small number nest in southwestern Norway as far north as 62° north latitude (Collett, 1873; Schaanning, 1913), but in Sweden it is more common as a nesting bird, the range extending on the Bothnian Gulf littoral north to 65° and to Quickjock on the Arctic Circle (Wallengren, 1854). A limited number nest in Denmark (Kjärbölling, 1850) and to a still lesser extent throughout Germany, even so far south as Bavaria and Würtemberg (Naumann, 1896–1905; Wüstnei, 1898; Hantzsch, 1903; Dahl, 1905; Detmers, 1911). In Holland it is said to be a common breeder (Schlegel, 1859; Albarda, 1886), but I find no evidence of its ever having nested in Belgium, though it is said to do so in Picardy, France (d'Aubusson, 1911), and exceptionally even in the *marismas* of southern Spain (A. Chapman and Buck, 1910). Specimens are occasionally seen in summer in northern Italy and the species is said to have bred in Sicily and near Venice, but the evidence is unsatisfactory (Arrigoni degli Oddi, 1904). There are a few records of nesting in Switzerland (Fatio, 1904). In what is now Czecho-Slovakia there are a number of localities where the Shoveller nests regularly and in some numbers (Fritsch, 1872; von Tschusi zu Schmidhoffen and von Dalla-Torre, 1890). According to Mojsisovics von Mojsvár (1897) it breeds commonly near Apaj, Austria, and in Hungary it does so in many localities, chiefly in the south (von Mojsisovics, 1886; Csato, 1885). A few seem to nest in Montenegro (Reiser and von Führer, 1896) and the species has been found breeding near Svistov (Reiser, 1894). In Rumania it nests commonly in the Dobrudja (Sintenis, 1877) but not in great numbers in Transylvania (von Tschusi zu Schmidhoffen and von Dalla-Torre, 1890).

Russia

The Shoveller nests plentifully in parts of Poland (Taczanowski, 1888; Katin, 1912; Schauer, *fide* Naumann, 1896–1905). In Russia it has been recorded as breeding commonly in the Crimea (Radde, 1854; Brauner, 1899) and Ekaterinoslav (Valkh, 1911), in Cherson (Brauner, 1894), Bessarabia (Radakoff, 1879), Orel (Daniloff, 1864), Moscow and Tula (Menzbier, 1881; Lorenz, 1892), Kazan (Russki, 1893), the Urals north of 50° north latitude (Harvie-Brown, 1878), in the former Baltic Provinces (Loudon, 1909), Pskof (Zarudny, 1910), St. Petersburg (von Brandt, 1880; Bianchi, 1907), Novgorod (Bianchi, 1910) and commonly in Archangel and along the lower Petchora (Goebel, 1869a; Seebohm, 1882a).

Finland

In Finland the breeding range is confined to the southern half (von Nordmann, 1864; Suomalainen, 1908; Palmgren, 1913) but on the coast specimens have been taken so far north as Uleaborg and Tornea, and there is one record for Lapland, 69° north latitude (Palmén, 1876). According to a recent writer (Montell, 1917) the species is a rare breeder in northwestern Finland (Muonio-Enontekis district) as far as the Norwegian border.

Whether or not the Shoveller ever breeds in Africa is still a disputed point. Spatz (Koenig, 1893) asserts that he found it nesting on Curiat Island off the east coast of Tunis, and Tristram (Baldamus, 1858, p. 134, footnote) received eggs taken in June in Algeria. Shelley (1872) speaks of the species as resident in Egypt and von Heuglin (1873) says the same for Abyssinia. It is true that specimens are seen quite frequently as late as May in the Nile basin, but these are probably non-breeders. At any rate the published evidence of its breeding in northeastern Africa is insufficient. In Cyprus a few are known to nest (Bucknill, 1911).

Africa

In Asia this species breeds all over the Khirgis steppes (Nazarow, 1887; Suschkin, 1914) and throughout the Caucasus (Radde, 1884), as well as in northwestern Persia, along the southwestern Caspian (Radde, 1886). In the eastern part of Transcaspia, especially about Merv, it is an abundant nester (Radde and Walter, 1889; Zarudny, 1889–90). According to Lansdell (1885) and Menzbier (1888) it breeds all over Turkestan, excepting the desert regions of the southwest, and it probably nests also in Pamir (Severtzoff, 1883). Possibly some may nest in Kashmir, where it is said to occur all summer (Adams, *fide* Hume and Marshall, 1879), for it is known to breed about Yarkand and in southern Kashgaria (Scully, *fide* Hume and Marshall, 1879; Koslow, 1899). In western Siberia it breeds north practically to the Arctic coast (Buturlin, 1908). Suschkin (1913) states that it does so in southwestern Siberia and in the Russian Altai. P. and J. Zalesski (1915) have recorded it from Tomsk, and Ushakov (1913) says it breeds everywhere in the Tobolsk Government. Finsch (1877) claims to have met with it in the Ob delta at Obdorsk in July. Farther east a specimen has been taken in the Sajan Mountains in late May (A. T. von Middendorff, 1853) and most likely the species breeds throughout the mountainous regions of Mongolia. Prjevalski (1878) found it in the Hoang-ho valley in late July and Radde (1863) says it breeds on the Tarei-nor. Seebohm (1879) found it rare on the Jenesei, and Popham (1898) has recorded it from Jeneseisk. According to Palmén the breeding range in this region extends to 66° 30′ north latitude. Still farther east the Shoveller nests in Transbaikalia (Dybowski, *fide* Taczanowski, 1893) and along the Lena and Wiljui (Maak, 1859) as well as on the Adytsha and the Jana, north to 67° 30′ north latitude (Palmén, 1887; von Bunge and von Toll, 1887). The northeasternmost record is of a specimen taken at Nijni Kolymsk early in June (Thayer and Bangs, 1914). J. A. Allen (1905) records it not common at Gichiga, but in Kamchatka it is abundant in May, though it has never been found actually breeding there (Stejneger, 1885; Bianchi, 1909a). On Bering Island it is a rare bird, except in early April. It may breed there (Stejneger, 1885; Bianchi, 1909a; Hartert, 1920). Southward the species is common along the middle and lower Amur and Ussuri and a few nest near Lake Hanka (von Schrenck, 1859; Maak, 1859; Prjevalski, 1878; Dybowski, *fide* Taczanowski, 1893). A specimen has been taken near Boatassin, Saghalin, early in June (Hesse, 1915). It might be added here that there is one exceptional case of the Shoveller breeding in Ceylon (Layard, *fide* Legge, 1880).

Asia

Winter Range

In the New World the Shoveller winters on the Pacific coast north as far as Puget Sound, where it is rather common (W. L. Dawson and Bowles, 1909; Rathbun, 1915; and others), but it is very rare in Oregon, there being only a few records (Woodcock, 1902; Eliot *et al.*, Bird-lore, vol. 23, p. 31, 1921). In California, on the other hand, it is abundant during the winter (Grinnell, Bryant and Storer, 1918). Many pass over to the Hawaiian Islands (Henshaw, 1902; R. C. L. Perkins, 1903), Laysan (Schauinsland, 1899) and Clipperton Island (Beck, 1907). Others spend the cold season in southern Arizona (Swarth, 1914) and New Mexico (Cooke, 1906), as well as in Texas, especially on the coast (J. C. Merrill, 1878; Strecker, 1912; Griscom, 1920). A great many winter in Louisiana (Beyer, Allison and Kopman, 1907; and others) and a few are found in this season in the Mississippi Valley, in Arkansas (Howell, 1911) and north rarely to southern Illinois (Cooke, 1906; Ferry, 1907). In Florida it is common in places (Maynard, 1882; Scott, 1892; Cory, 1896; etc.) and the range extends northward on the coast through South Carolina (Wayne, 1910) and North Carolina (T. G. Pearson,

C. S. and H. H. Brimley, 1919) to Virginia (Rives, 1890), Maryland (Cooke, 1906) and Delaware (Rhoads and Pennock, 1905). There are even a few winter records for New Jersey (Cooke, 1906).

Atlantic Islands

So far as I know there is only one record of its occurrence in the Bermudas (S. G. Reid, 1884) and none for the Bahamas. But in the West Indies it is found in variable numbers in Cuba (Gundlach, 1875; Barbour, 1923), Porto Rico (Wetmore, 1916), Jamaica (P. L. Sclater, 1910), St. Thomas (A. Newton, 1860), Dominica (U.S. Biological Survey), Barbados (Feilden, 1889), and Trinidad (Léotaud, 1866).

Southern North America

This is a very common duck south of the United States in winter. It has been found in almost every State of Mexico and is recorded from Sonora (G. N. Lawrence, 1874; J. A. Allen, 1893), Sinaloa (G. N. Lawrence, 1874; Miller, 1905), Tepic (H. H. Bailey, 1906), Zacatecas (British Museum), Nuevo Leon (Sanchez, 1877–78), Tamaulipas (Phillips, 1911), the whole Gulf Coast (Sanford, Bishop and Van Dyke, 1903), Guanajuato (British Museum), Jalisco (Sanchez, 1877–78; Beebe, 1905), Colima and Michoacan (U.S. Biological Survey), Valle de Mexico (Villada, 1891–92) and southern Vera Cruz (P. L. Sclater, 1862). In Central America it has been found in Guatemala (Salvin and Godman, 1897–1904), Nicaragua (Rendahl, 1919), Costa Rica (von Frantzius, 1869; Carriker, 1910) and Panama (Bangs, 1901; de Armas, 1893). The southernmost records in the New World are for Colombia, South America, where specimens have been taken at Bogotá (P. L. Sclater, 1855) and Medellin (P. L. Sclater and Salvin, 1879). Stray birds occasionally summer in the far south (Museum of Comparative Zoölogy specimen from near Mexico City in August).

Europe

In Europe the Shoveller winters in the British Isles, north even to the Hebrides and Orkneys (Rintoul and Baxter, 1920a; Seebohm, 1885; H. Saunders, 1899; etc.) and quite commonly in Ireland (Ussher and Warren, 1900). On the Continent a few occasionally pass mild winters in western and southern Germany (Oldenburg, Schwerin, Lippe, Hessia, Baden, and Bavaria) and there is one winter record for Pomerania (Naumann, 1896–1905). Some winter in the Netherlands or Belgium, and Ternier and Masse (1907) state that a few may be found in Normandy, while d'Aubusson (1911) says the same in regard to Picardy. It has wintered near Montlucon in the Bourbonnais (des Prugnes, 1912) and is common in the cold season in Provence (Clarke, 1898; l'Hermitte, 1916). In Portugal it is a rather common bird in winter (A. C. Smith, 1868; Tait, 1887; de Seabra, 1910) and in Spain it is plentiful, especially in the south, and it occurs also on the Balearics (Reyes y Prosper, 1886; Arévalo y Baca, 1887; A. Chapman and Buck, 1910). It is a common bird in Sardinia (Salvadori, 1865; Brooke, 1873) but is not abundant in Corsica (J. Whitehead, 1885; Jourdain, 1912). C. A. Wright (1864) speaks of it as abundant in Malta, but throughout Italy it is not common in winter, excepting perhaps in the southern provinces (Giglioli, 1889–91; Arrigoni degli Oddi, 1904). A few winter in the warmer parts of Switzerland (Fatio, 1904) and in the Tyrol (Althammer, 1857); but it is not common in Dalmatia (Kolombatovič, 1903). Mojsisovics von Mojsvár (1897) says some winter in the Drave region of southern Hungary, and farther south, in Albania and throughout Greece, it is abundant (Powys, 1860; von Lindermayer, 1860; Lodge, 1909). Elwes and Buckley (1870) speak of it as very common in Macedonia. E. von Middendorff (1891) mentions specimens taken in winter (December 8, 1886) at the mouth of the Volga.

Africa

In West Africa the Shoveller has been taken as far south as Zaria in northern Nigeria (Hartert, 1915). Verreaux (*fide* Hartlaub, 1857) met with it on the Casamance, but it seems doubtful whether it goes regularly farther south than Morocco. De Rochebrune's (1883–85) statement that it is common in Senegambia is not trustworthy. It is rare on the Canary Islands (Bannerman, 1919) and seems to have been taken only once in Madeira (Schmitz, 1907). In Morocco it is fairly common (S. G. Reid, 1885; H. and A. Vaucher, 1915) and the same is true of Algeria and Tunis (Talamon, 1904; J. I. S. Whitaker, 1905; Zedlitz, 1909; Millet-Horsin, 1912). In East Africa the range extends much farther south for it is abundant in Egypt and Nubia (Shelley, 1872; Cecil, 1904; Nicoll, 1919) and along the White and Blue Niles (von Heuglin, 1873; Jägerskiöld, 1904; Ogilvie-

Grant, 1902). Von Heuglin (1873) took specimens occasionally on both sides of the Red Sea and other travellers (Matschie, 1893; Yerbury, 1896) have found it in the Aden district of southern Arabia. Salvadori (1894) has recorded it from Gurat in Somaliland, while Emin Pasha (Reichenow, 1900) met with it in Wadelai. On the lakes of southern Abyssinia and about Harrar it has been found in enormous numbers (von Heuglin, 1873; Salvadori, 1884, 1888; Ogilvie-Grant, 1900; von Erlanger, 1905). According to B. Horsbrugh (1912) it has been found in British East Africa, and it is usually common on Lake Naivasha (so Dr. Van Someren told me), while in what was formerly German East Africa specimens have been taken on the Nyeri swamps (Schillings, 1905). Sjöstedt (1910) says the species was several times seen in the Kilimandjaro region. Fairbridge (1893) has recorded a specimen taken eight miles from Capetown on September 15, 1892, a record which is open to question.

Asia

The Shoveller winters commonly in Palestine (Tristram, 1884; Meinertzhagen, 1920a) and in the Taurus region of Asia Minor (Danford, 1880), if not throughout the whole of the latter region, at least on the coast. Members of the British Expeditionary Force found it common in Mesopotamia (T. R. L., 1918; Stoneham, 1919). Sharpe (1886) has recorded it from Fao on the Persian Gulf and it is known to winter in many parts of Persia, even in the northwest along the Caspian and in the Parapamis region (Radde, 1886; Zarudny, 1911). It is not common in southern Afghanistan (O. B. St. John, 1889; C. Swinhoe, 1882; C. H. T. Whitehead, 1909), but winters in considerable numbers in Baluchistan, especially in the south (Zarudny, 1911; Meinertzhagen, 1920). A few winter as far north as Yarkand (Scully, *fide* Hume and Marshall, 1879) and a good many do so in Kashmir (*ibid.*) while it is found everywhere throughout India, south to Ceylon and east to Assam (Hume and Marshall, 1879; Legge, 1880; Baker, 1908). In Arakan it is rare (Hopwood, 1912) and it is not very common either in the Shan States (Bingham and Thompson, 1900; Rippon, 1901). A specimen was taken in Siam near Bangkok and another at Kuala, Lampur, Federated Malay States, 3° north latitude (Williamson, 1916). The British Museum has a specimen from Cochin China.

China

In China the Shoveller is found in winter only in the southern parts. E. H. Wilson (1913) met with it near Kiating, Szechwan, but in the Yangtse basin it is found only sparingly (Styan, 1891; Wade, 1895; La Touche, 1922). On the other hand it is common at Foochow and Swatow (La Touche, 1892) and not rare about Hong-kong (Vaughan and Jones, 1913).

Formosa

It is common also in Formosa (von Heuglin, 1874) and in southern Japan, north at least as far as Tokio (Blakiston and Pryer, 1878; Seebohm, 1890). Specimens have been taken in the Loo-choo group, one even in midsummer, on July 12 (Ogawa, 1905)!

Japan

Pacific Islands

A number of specimens have been taken in the Philippines (R. C. McGregor, 1909) and in northwestern Borneo (Moulton, 1914). The easternmost record is of a pair taken on Big Makin Island, Gilbert group, on June 22, 1894 (North, 1895)! The statement of Gould (1865) that the Shoveller has been taken in New South Wales, Australia, requires further substantiation.

It is possible that several species of ducks, including the Shoveller, are found in winter on the Fanning and Washington Islands (information given to Dr. A. Wetmore by a diver named Anderson).

Migration

The Shoveller is one of the late migrants in the spring, and is correspondingly early in the autumn. It shows a tendency to linger on its journey north and often stays so late that observers are inclined to rank it as a breeding bird. Thus in the Valle de Mexico it has been seen as late as early May (Villada, 1891–92), while in northern Mexico specimens are seen in late May (Sanford, Bishop and Van Dyke, 1903); according to Léotaud (1866) it does not leave Trinidad until April or May. But most of the birds pass through the United States in March or April. Representative dates of arrival taken from Cooke (1906) and from various local writers, are as follows: Colorado, March 10–20; Montana, mostly in the middle of April, once as early as March 24; Kansas, March 15–April 1; Nebraska, March 25; South Dakota, April 1–15; North Dakota, April 13; Iowa, March 23; Minne-

sota, not before April 5, once as early as March 26; Illinois, late March to April 20; Indiana, early to middle of March; western New York, March 15–April 5. In Canada the Shoveller does not arrive before May, appearing at Edmonton, Alberta, on May 1; at Fort Chipewyan, May 7; at Fort Resolution on May 18; and at St. Michael's, Alaska, May 11–20.

In the northeastern States and in eastern Canada the Shoveller scarcely occurs in spring (exceptional in New Jersey and Quebec) and it is one of the very rarest ducks in autumn throughout the St. Lawrence basin and the Maritime Provinces as well as in New England. It becomes commoner in the Middle Atlantic States. Stray specimens have been taken near Cartwright, southern Labrador, in September (C. W. Townsend and Allen, 1907) and at Romaine, Quebec, in June (H. F. Lewis, 1922). Statistics for autumn migration are not so plentiful but the situation is well summed up by Cooke (1906): "An individual seen at Erie, Pa., September 6, 1893, marks about the beginning of the autumn migration, and soon after this, by the middle of the month, the earliest migrants have reached the mouth of the Mississippi River. The larger portion have departed from the northern United States by the middle of October, and the region just north of the winter range is deserted early in November. South of the United States, at the southern end of Lower California, the first arrivals have been recorded October 18; Guaymas, Mexico, November; Panama, October 16; Cuba, September; Jamaica, November; Trinidad, December."

In Europe and Africa the situation is very similar, though the spring migration seems to begin somewhat earlier and is very extended. Thus in Abyssinia this duck is found as late as the middle of March (von Erlanger, 1905); large flocks have been seen west of Fashoda in April (Ogilvie-Grant, 1902) and in Fayûm it was seen in May (von Heuglin, 1873). But the bulk leave Egypt in March (Nicoll, 1919) and Tunis in February and March. In western Europe they move north early, leaving Corsica in late February or early March (Jourdain, 1912); Italy in March and April (Arrigoni degli Oddi, 1904); Spain in February and March (Arévalo y Baca, 1887), and Portugal in March (Tait, 1887). Early arrivals have been noted in Holland and Bohemia in February (Albarda, 1886; Fritsch, 1872), but the British Isles, France, Netherlands, Germany and other countries of western and central Europe are usually reached in March or early April. The average date of arrival for Hungary in the years 1895–1911 was March 27 (Aquila, vol. 19, p. 145, 1912). In eastern Europe the movement seems to be somewhat later. Shovellers appear in Rumania in the second week in April (Aquila, vol. 15, p. 328, 1908; vol. 16, p. 313, 1909) and on the lower Volga in March (Moeschler, 1853), while farther north arrivals have been noted at Smolensk, April 3–4; at Moscow, middle of April; in the Baltic Provinces, April 1; at Pskof, late April; at St. Petersburg, late April; on the Petchora, May 21; and at the mouth of the Petchora on June 19.

In autumn most of the birds leave the northernmost breeding grounds in September, though some have been known to stay in the Baltic Provinces until November 1 (Loudon, 1909). In France, Germany and central Europe generally the migration takes place in September and October, and most reach the wintering grounds in the Mediterranean countries in those months, though in Spain, Italy, Greece, etc., some arrive much earlier, occasionally in August.

The situation in Asia is essentially the same. In Transcaspia a great migration was witnessed near Merv from March 18 to 25 (Radde and Walter, 1889). The birds disappear from India before the end of April, though some linger till May and in Kashmir till late May (Hume and Marshall, 1879). Some stay in the vicinity of Kohat and Kurram till May 20 (C. H. T. Whitehead, 1909) but in Tibet they have been seen in April (H. J. Walton, 1906). There are mid-May records for Mesopotamia but no evidences of breeding there (Ticehurst, Buxton and Cheesman,1922). For more northern regions the following data are available: Tarei-nor, April 7–18 (Radde, 1863); Dalai-nor, March 30; Kuku-nor, March 14–April; Lake Hanka, early March–April 1 (Prjevalski, 1878); Jenesei River, 66° north latitude, June 18 (Seebohm, 1885); Wiljui River, May 15 (Maak, 1859); Gichiga, middle of May (J. A. Allen, 1905); Kamchatka, May, and Bering Island, early April (Stejneger, 1885; Bianchi, 1909a).

Information as to the autumn migration in Asia is too meager to allow of generalization. Shovellers leave the Wiljui late in August (Maak, 1859), but they have been seen near Gichiga as late as the end of September (J. A. Allen, 1905) and a specimen was taken on Bering Island as late as October 11 (Hartert, 1920). In Kashmir some arrive as early as September (Scully, 1881), but they do not reach India proper until after October 22, while most of them appear in the middle of November (Hume and Marshall, 1879).

Returns of Banded Shovellers: Of forty-eight banded by A. Wetmore at Salt Lake, Utah, nine returns were received. These were all from localities not far away except one, which was taken a year later at Vallejo, California (U.S. Biological Survey).

One marked on the Swedish Isle of Öland on the 28th of May, 1912, was shot the 20th of August of the same year near Peronne, Department of Somme, France, distance about 1200 kilometers (Thienemann, 1914). This shows how early the migration begins.

One ringed in Warwickshire, England, in mid-winter, was taken over five years later in Jutland, Denmark. Another, apparently a local breeding British specimen, was taken in mid-winter in Holland (British Birds, vol. 14, p. 130, 1920).

GENERAL HABITS

The Common Shoveller, which has even a wider distribution than the Mallard, is, on account of its ungainly appearance, one of the most familiar of all ducks. The huge bill, from which it derives its name, is armed with rows of greatly enlarged bristles (lamellæ) which serve the purpose of a sieve. An interesting point in connection with this specialized bill is the fact that at hatching time the duckling has a perfectly normal-looking mandible, narrow, somewhat high at the base, and no longer than the bill of the young Mallard. It seems quite likely, therefore, if we apply the recapitulation theory of the embryologists, that the huge bill has been rather recently acquired. Generally considered the Shoveller has something in common with the Blue-winged Teals and the Mallard, but the Shoveller group is characterized not only by the bill, but by the exceptional length of the intestine, which is from 6.5 to 10 feet long, nearly twice as long as that of most other surface-feeding ducks. Shufeldt (1888) made a careful study of the skeleton and showed that with the exception of the bill it is not very different from that of many other ducks and resembles the Teal's.

Aside from its rather specialized diet, there is nothing very peculiar about the habits of the Shoveller. It prefers shallow, muddy, stagnant pools and marshes, where the bottom ooze contains an abundance of minute vegetable and animal life, such as ostracods, copepods, diatoms, and algæ.

Its preference for filthy village pools in India called forth caustic and uncomplimentary remarks from Hume (Hume and Marshall, 1879). "Filthy," he says," is quite an inadequate epithet for many of these reeking sinks of pollution, but foul or fair, the Shoveller is equally at home in them, and may be seen at all hours, feeding along the very edge, now just in and now just out of the water, making not epicurean selection, but feeding on pretty well every organic substance that comes to hand, nice or nasty. . . . All ducks are more or less omnivorous, but no other duck will, as

a rule, frequent the dirty holes in which a pair of Shovellers often pass the entire winter, sticking to their cess-pool (for it is really, as the season advances, little short of this) so long as a bucketful of liquid filth and mud remains."

Of course the above description applies to a somewhat extreme case. Filth is not an essential of its haunts, but soft slimy mud rather than mere abundance of the clean pond-weeds and sedges is what it seems to require. It is usually found on the coasts only accidentally during migration, or perhaps in very severe weather, but it does show a great liking for fresh or brackish waters close to the seashore. One observer has found it frequenting a salt-marsh near Haywards, California, and even nesting there (Emerson, 1901).

Wariness. The Shoveller, like the Blue-winged and Cinnamon Teals, is a very tame duck, over all parts of its range. More than this, it is an extremely foolish bird where wooden decoys are concerned, and will come up like Teal, without showing any suspicion. Like Teal, too, the Shoveller is apt to be found in the vicinity of dwellings, and many sportsmen have remarked that they are less likely than other ducks to rise from a marsh on the report of a gun.

Daily Movements. In spite of the minute character of some of its diet, the Shoveller is well able to feed by night, particularly on moonlight nights. The food is probably selected much more by the sense of touch than by sight. Some writers (A. E. Brehm, 1879; Millais, 1902) have considered this species more active at night than any of the other surface-feeders.

Gait, Swimming, Diving. The general shape of the bird gives it a very clumsy and unattractive appearance, but in spite of the huge bill, the gait and carriage differ little from those of other shoal-water ducks. The neck is rather short, and on the water the Shoveller keeps the head well drawn in, with the bill often resting on the surface. It is perhaps more strictly a surface-feeder than any other duck, although it dives expertly when young, and moderately well when wounded. In the Province of Hanover young Shovellers have often been found in eel-pots resting on bottom in water four feet deep (Ziemer, 1886, p. 376).

Although they feed mostly by skimming and dabbling close to the surface or in very shallow places, the Mallard-like tipping is occasionally indulged in. When feeding in this way they are said to retain the position for a shorter time than the Mallard and to hold themselves less perpendicularly (Gundlach, 1875). I do not remember ever having seen Shovellers obtain food in this way, but I have no doubt that they do so. Actual diving for food on the bottom has been noted by A. Chapman (1916) among wild birds resorting to the ponds of the Zoological Gardens at Cairo, where I have myself seen hundreds of these ducks during the spring migration.

Flight. The flight is very much like that of related ducks, being rapid and nearly noiseless, resembling the flight of Teal in its erratic and dodging character. Shovellers are apt to skim about low over the marshes and give one very sudden surprises as they dart in unexpectedly over the decoys, presenting difficult and shifting targets. The actual speed of the flight has not been measured, but is probably nearly the same as that of Teal. They do not rise so easily nor so perpendicularly as does the Mallard, and the effort they make causes a rattling or whistling noise, which has given them various nicknames (Rattle-wing in English, Schell- or Schallente in German).

Shovellers ordinarily travel in very small groups numbering from three or four to six or eight. Really large flocks of fifty to one hundred are quite exceptional and are probably seen only during active migration. Ducks of this and other species are often killed against lighthouses, and there is a record of a pair of Shovellers killed by flying against a stone-wall in Cheshire, England (Coward and Oldham, 1900).

Association with other Species. Though not at all a gregarious duck, its inquisitive and somewhat sociable nature frequently brings it into the company of other species, particularly the Blue-wing in America and the Garganey in the Old World. It is also occasionally seen among the flocks of other surface-feeding ducks. On our western prairies, where mixed clutches are exceptionally common, Shoveller's eggs have been found in the nests of the American Widgeon. Four eggs of the Lesser Scaup have been found in the nest of a Shoveller which contained ten of its own eggs (Job, 1902).

Voice. The Shoveller is one of the most silent of ducks. In the winter one may see hundreds without ever hearing a sound from either sex. Unlike most shoal-water ducks, the male does not have a whistling note. His call, which is purely a courtship note, is low, abrupt, somewhat husky and may be expressed by the syllables *shaup-shaup* (Harper, MS.). This sound, which is only a modified quacking note, has also been transliterated as *cruk-cruk* (J. I. S. Whitaker, 1905), *quuck-quuck* (Finn, 1915), *woak-woak* (Naumann, 1896–1905), *chu-uck-chu-uck* (Wetmore, 1920). The female has a hoarse but not very loud quacking note.

The trachea of the male is slightly larger toward the lower end and supports a very moderate-sized, left-sided *bulla ossea*, resembling that of the Teal more than that of the Mallard. John Ray described it as long ago as 1678.

Food. Analysis of stomach contents presents many difficulties because there is a large amount of bottom ooze consisting of more or less decayed vegetable débris, often containing large numbers of plants and animals such as diatoms and ostracods. These small organisms supply most of the nutriment which is derived from the so-

called mud found in the stomachs. However, out of seventy stomachs analyzed by McAtee of the U.S. Biological Survey, only 15 or 20% contained any ooze. The stomachs were taken for the most part in November and February in the South Atlantic and Gulf States. No doubt a series of summer specimens would show a much higher per cent of animal food, but as it is, the animal food is over 34%, a much greater proportion than in any other American shoal-water duck except the Florida Dusky Duck. Dr. E. W. Nelson, Chief of the U.S. Biological Survey, has sent me unpublished notes on the result of McAtee's work from which I quote freely because, although much of the diet is the same as in other ducks, there are some items of great interest (see also McAtee, 1922).

"The largest item of animal food is molluscs, practically all of them fresh-water univalves. They constituted 18.97% of the total or more than half of the animal food of the Shoveller. No fewer than 280 *Physa heterostropha* were counted in one stomach contents and 1100 *Amnicola floridana* in another. Unidentified snails were found in twenty-nine of the eighty-four stomachs examined and the following identified kinds in the number stated in connection with each:

Amnicola floridana	2	Lymnæa sp.	1
Amnicola limosa	1	Planorbis exacuous	1
Amnicola porata	1	Planorbis parvus	4
Amnicola sp.	2	Planorbis trivolvis	1
Neritina reclivata	4	Physa heterostropha	2
		Physa sp.	2

"Aquatic insects are next in importance in the regimen of the Spoonbill Duck, water-bugs contributing 3.64% to the diet and water-beetles, caddis larvæ, dragonfly nymphs, and all other insects together about one per cent each. The water-bugs were chiefly water-boatmen (Corixidæ) found in nine stomachs. These small creatures swarm over the bottom ooze and play an important part in transforming nutriment gathered there into meat much sought by higher forms. Other water-bugs captured by the Spoonbill include back-swimmers (Notonectidæ, among them *Notonecta undulata*), one of the medium-sized species of 'giant water-bugs' (*Zaitha*) and a water scorpion (*Ranatra*).

"The water-beetles eaten are chiefly small species, but include a few of the highly predaceous larvæ known as water-tigers (Dytiscidæ). A list of the water-beetles identified from Shoveller stomachs is:

Haliplus punctatus	1	Dytiscidæ	3
Haliplus ruficolis	1	Berosus sp.	3
Haliplus sp.	1	Tropisternus	2
Bidessus pullus	1	Water-beetles	
Bidessus sp.	1	(further unidentified)	4
Hydroporus sp.	1		

"Caddis larvæ and their cases and dragon-fly nymphs are most numerous among the other insects preyed upon, but there is nothing of special note regarding them, nor were any of them identified. The remaining insects included larvæ of midges, soldier-flies, horse-flies, may-flies, a hymenopteron, and a bird louse, of a species (*Lipeurus squalidus*) known to infest the Shoveller. Not insects but more closely allied to them than to other orders are the water-mites (Hydrachnidæ) which were identified from five stomachs.

"Remains of small fishes composed nearly three per cent of the food of the Shovellers examined; in one case six small carp (*Cyprinus carpio*) had been taken by a single bird. Crustaceans make up the balance of the animal food and although two crawfishes were among them the great bulk was made up of those minute bivalved forms known as Ostracods together with a few of the naked Copepods. In one instance hundreds of Ostracods had been consumed as part of one meal. In the case of a Shoveller collected at South Island, S.C., March 31, 1905, a male specimen of a new species of *Ilyodromus* was identified by Dr. R. W. Sharpe of New York, who stated that the genus had not previously been reported from North America and that no male had ever before been found. The names of the Ostracods identified and the number of stomachs in which found are:

Candona sigmoides	1	Cypris pellucida	2
Candona simpsoni	2	Cypridopsis vidua	1
Candona sp.	3	Cythere sp.	1
Cypria dentifera	2	Ilyodromus sp.	1
		Potamocypris smaragdina	1

"Foraminifera were found in a single stomach from the Mississippi Delta, and oligochæte worms in two.

"The approximate two thirds of the diet of the Shoveller derived from the vegetable kingdom is drawn from numerous plant families none of which is of really preponderating importance. A fair share of the total, of course, is composed of the macerated plant débris which is so important a constituent of the bottom ooze. Aside from this indeterminate material the leading items are: sedges, 16.02%; pondweeds, 11.25%; grasses, 8.28%; algæ, 6.55%; waterlilies, 2.5%; duckweeds, 1.7%; and smartweeds, 1.1%. Chiefly the seeds of sedges are eaten, those most in favor being bulrush (*Scirpus*) and saw-grass (*Mariscus*). About 200 seeds of the latter plant were found in one stomach. The pondweeds consumed were mostly *Potamogeton* and widgeon grass (*Ruppia*) of which more than 150 seeds were counted in single gizzards, but of another genus of this family, the horned pondweed (*Zannichellia*), more than 1600 seeds were taken by one bird at a meal. The grasses identified in the Shoveller's food were mostly switch-grasses (*Panicum*), and cultivated rice. However, the seeds of the latter eaten were shattered grain gleaned in the fields in winter, and their consumption is a benefit, since volunteer rice is very ob-

jectionable. About 300 seeds of a beach grass (*Monanthochlöe littoralis*) were found in one stomach. The algæ determined were musk-grasses (*Chara*) but filamentous algæ not identified are just as important a proportion of the food. Diatoms were detected in two stomachs. Seeds of waterlilies, largely those of water-shield (*Brasenia*) and stolons of the banana waterlily (*Castalia mexicana*) represent this family in the Shoveller's diet; duckweeds (*Lemnaceæ*) are eaten entire, and seeds again of smartweeds are the portion sought. The only other item of plant food worthy of special note is the velvet duckweed (*Azolla caroliniana*), a fern ally growing on the water surface of southern swamps, specimens of which composed nearly half of the contents of one stomach; it seems to be rarely eaten by birds.

"Other observers have added to the Shoveller's diet as follows: Audubon (Orn. Biogr. 4, 1838, p. 241) reports leeches as part of the food of the Shoveller; Aughey (Rep. U.S. Ent. Comm. 1877, app. 2, p. 59) found Rocky Mountain locusts (*Caloptenus spretus*) in a stomach he examined; Baker (Proc. Ac. Sci. Phila., 1889, p. 267) reports the mollusk (*Rissonia pulchra*); Fisher (N. A. Fauna 7, 1893, p. 17) notes that: 'At . . . Owens Lake, Calif., Mr. Nelson found it feeding extensively on the larvæ and pupæ of a small fly (*Ephydra hias*) which abounds in the lake,' Lantz and Piper (Biol. Survey Field Notes) observed it feeding greedily on maggots as they floated downstream from a dead cow; and Samuels (New England Birds, p. 497) adds tadpoles to its bill of fare." It has been commented upon as an enemy of amphipods (H. H. T. Jackson, 1912).

Courtship and Nesting. Old male Shovellers arrive on the breeding grounds in all the perfection of the spring plumage, but the males of the previous year have the plumage by no means fully developed. Naturalists are divided on the question as to whether or not these young males breed the first season. It will probably be found that those hatched early in the previous season reach sexual maturity by the following spring. Certainly no shoal-water duck is more irregular than the Shoveller in assuming the full dress. Sometimes old and otherwise perfect male specimens will have a brown feather here and there to mar the white of the breast. Absolutely perfect specimens are more rare than in any other species. But it must not be forgotten that lack of full plumage is not necessarily an indication of sexual immaturity either in this or other species.

In the Mississippi Valley (Portage des Sioux, Missouri) U. S. Biological Survey workers found Shovellers beginning to pair off as early as February 21 and they were mostly mated by March 24, rather earlier than most other ducks.

The display is simple and unpretentious, and almost the same as among the Blue-winged Teals. It has been well described by many writers, and consists merely in the male's moving the head directly up and down, while the bill is held in a horizontal position. At the same time the characteristic chuckling note is uttered. The female

makes responsive actions similar to the movements of the male, though perhaps less pronounced.

The nuptial flight, which was described long ago by Naumann and many times since, is well developed and does not differ essentially from that of other surface-feeders. At the mouth of the Athabasca, Mr. Francis Harper (MS.) noted such flights on June 15, 16, and 20, 1920. From two to four males engaged in the pursuit of one female, and he once saw a male, perhaps the true mate, trying to fend off a rival while on the wing.

The curious habit, common, it seems, to all species of Shovellers, of swimming in close circles one behind the other, has led some writers to suggest that this trait may be connected with display activity, particularly as it appears to be more common in the spring than in the winter. It is much more probable, however, that it is a practice developed to stir up insect larvæ which would be sought after much more in the spring than in autumn and winter.

Millais (1902) has called attention to what he considers a sort of polyandry in the domestic affairs of the Shoveller. He says it is rather common to see a female attended by two males, and he has found that one of these males is usually a bird of the previous year, with incomplete plumage. The two husbands, according to his observations, get along in perfect amity. No one else seems to have noticed a similar state of affairs, so I think it is probably exceptional, and due to local excess of males.

The spring migration is somewhat late, and the nesting season is at least a month later than with the Mallard. Throughout northern States and Canada the average date is for early June but in Utah they lay in late April and early May. In western Europe the eggs are commonly laid in May.

There is nothing characteristic about the position of the nest, which is usually on dry land, in or near marshes, or prairie ponds, and sometimes well out on the open prairie. The clutch varies in number from eight to fourteen eggs, averaging about ten. One nest containing nineteen eggs is mentioned by Naumann (1896–1905). The eggs are pale olive-buff to grayish green in color, and resemble those of the Garganey, although they are larger. They cannot always be told from those of the Pintail, although they average smaller. In length they vary from 48–58 mm. and in width from 34–39 mm.; 103 eggs from the Old World averaged 52.58 by 37.11 (Jourdain, *fide* Hartert, 1920a) while 20 eggs in the United States National Museum averaged 55.5 by 37 mm. (Grinnell, Bryant and Storer, 1918). The nest-down is blackish or black, with faint white or light-brown tips, and light centers (A. C. Jackson, 1918). It is very similar to that of the Widgeon, excepting that it is slightly darker, though the two probably cannot always be distinguished. The down of the Pintail is larger and lighter. Diagnosis of the nest is said to be aided by examination of the feathers in it, which cannot be confused with those of the Pintail or Widgeon (H. Noble, 1908).

The incubation period is from twenty-two to twenty-four days (Naumann, 1896–1905; Cook, *fide* Job, 1915; Wormald, *in litt.*). The males desert the females soon after incubation has begun and, like other surface-feeders, gather into little bands, beginning after a week or two to change into eclipse. At the Athabasca delta a male beginning to go into eclipse was taken by Mr. Harper (MS.) as early as June 29, but males that had left the females were not common till after the first of July. Flightless males were shot on July 16. Mr. A. Wolfe of Edmonton, Alberta, has just written me that he has often seen male Shovellers accompanying the broods; and Ussher and Warren (1900) remark that the male shows concern for the young. A certain McWilliams (1916) says he has seen the male staying near the nest while its mate was incubating. A still more extreme case is quoted in the first edition of Saunders' Manual, but is discreetly omitted from the second. It is to the effect that on June 22, 1886, Mr. J. Whitaker found a male sitting upon three eggs. All such cases of exaggerated parental instinct in this sex must at best be exceptional, though no doubt they do occasionally occur in all species of shoal-water ducks.

Status. Although so widely distributed, the Shoveller occurs in great numbers with us only through a somewhat narrow range of country between the Mississippi Valley and the high plains just east of the Rockies. A certain number migrate through the Great Lakes region, but very few reach the Atlantic coast north and east of Delaware and Chesapeake Bays. At Long Point, on the northern shore of Lake Erie, they occur in those famous marshes so rarely that they are not entered on the shooting records of the Long Point Club. In the first week in October, 1916, I saw only one there, and I was informed that no more than six to twenty were ever taken in a season. Possibly conditions there are not exactly suited to this species, because at the Monroe Marsh near the west end of Lake Erie, between 1885 and 1901, there were 680 Shovellers taken, making an average of forty per season. The smallest number taken in any one year was three, in 1900; and the largest number 109, in 1898.

All over New England this is one of the rarest of the surface-feeding ducks, having about the same status as the Gadwall. For all these States together there are not more than perhaps fifty records. A fairly correct idea of its status in Essex County, Massachusetts, may be obtained from my own records of twenty-three years' shooting at Wenham Lake. During that entire period only five specimens were shot: one on October 8, 1901; one on November 6, 1903; and three on October 15, 1910. No others were even seen. Forbush (1912) seems to assume without very substantial evidence that the Shoveller was formerly a much more common bird in Massachusetts than it is at present. He even goes so far as to quote a supposed instance of the species breeding on Martha's Vineyard (No Man's Land) off the Massachusetts coast, on May 22, 1602 (Archer's account of Gosnold's voyage). I doubt if the

Shoveller was ever more plentiful in this region than it is to-day. Brewster's long experience with the birds of the Cambridge region, and that of Thomas Nuttall before him, show that in the last century there has been no decided change.

South and westward along the Atlantic seaboard the species does not become common until one reaches Maryland. Even at those great gathering points, — the Back Bay of Virginia and Currituck Sound, North Carolina, — it is by no means a plentiful duck. It comprises about 1% at the Princess Anne Club, Virginia, and from 1.2% to 1.3% of the total number of ducks taken between the years 1889 and 1917 at the Currituck Club. The number taken in one season there varied from 7 to 111. At the Swan Island Club, Currituck Sound, in the nine seasons (1909–10 to 1918–19) when I know the records were well kept, the proportion was considerably larger, about 3.3% of all ducks shot (795 out of 24,125). At the mouth of the Santee River, South Carolina, the percentage was about the same as at Swan Island for the years 1901–09 (717 out of a total of 22,084 ducks). In the old days, when rice was grown in these marshes, the Shoveller is said to have been far more plentiful (J. L. Peters, U.S. Biological Survey), but I am inclined to think that it was never so abundant as on the Gulf Coast.

Nowhere in the United States do Shovellers concentrate in such numbers as at the mouth of the Mississippi and along the coast of Louisiana. The Louisiana Conservation Commission Report estimates that in the season 1913–14, 36,864 Shovellers were shot in a total of 283,435 ducks taken in that State (over 13%). From my own observation I should say that they comprised 15% of all ducks in Vermilion Bay marshes, Louisiana.

Near Albuquerque, New Mexico, Leopold (1919) estimates that this species comprises about 10% of all ducks. In Monterey County, California, the records of the Empire Gun Club (1905–13) show that it comprised 18% of all ducks shot; and the records of two San Francisco Game Transfer Companies for 1910–11 tell us that 5855 Shovellers were handled in a total of 56,763 ducks (10%). The Shoveller is said to have diminished considerably in the past few years in California (Grinnell, Bryant and Storer, 1918), but now that market shooting has been stopped, and the better class of ducks are on the increase, it is doubtful if it will be destroyed in as large numbers as formerly.

In what is really the eastern part of its center of abundance, in Minnesota, the report of the Commissioners for 1919 and 1920 estimates that the Shoveller was sixth in order of abundance in the former and seventh in the latter year. It seems that about 4% of all ducks belong to this species.

As I remember the plains of northern Montana, I should say that this duck is second only to the Blue-winged Teal in abundance early in September. Oberholser (1920) places it next to the Blue-wing as a summer resident in western Nebraska, and speaking of southwestern Saskatchewan, Bent (1907) remarks that it and the

Blue-wing are about equally common, and next to the Gadwall as breeding birds. In the Athabasca delta, somewhat north of its chief breeding grounds, Harper (MS.) considered this duck ninth in abundance of the seventeen species nesting there.

On the Bear River marshes, Utah, Wetmore (1921) found it the fourth commonest breeding duck, and he estimated at least 250 pairs in that locality. Writing in 1903 about Wisconsin, Kumlien and Hollister say that the species had not decreased like the other ducks.

In the Old World there has been a marked increase in England since 1876 (H. Saunders, 1899) and in Scotland since the '80's and '90's (Millais, 1902; Rintoul and Baxter, 1920a); in Ireland the species was practically unknown in William Thompson's day (1851) but when Ussher and Warren (1900) wrote it was breeding in half the counties, and was common on the great central plain. From 58 to 65 have been taken in the Kellyville Decoy in one season. English decoy records for the most part do not mention the species for the bulk of the birds leave before the decoy season is on, and return after the season is closed. Between 1833 and 1868 only 285 Shovellers were taken in a total of 95,000 ducks at the Ashby Decoy, Lincolnshire. In the Orielton Decoy, Pembroke, between 1905 and 1918, Shovellers numbered 94, and in the Borough Fen Decoy, Lincoln, in the season 1917–18 the extraordinary number of over 200 were taken (J. Whitaker, 1918).

There is no indication of any marked increase or decrease in continental Europe. At the mouth of the Rhone, Clarke (1898) at the end of September found it really abundant, a thousand being noted at one time. Not till one reaches the eastern Mediterranean is it met with in numbers comparable to those seen on our Gulf Coast. From my own experience I can say that it is one of the most abundant ducks in the Nile basin. In India, where it is undoubtedly very abundant, it does not congregate or concentrate in such numbers as on our southern coast.

Enemies. Same as for other surface-feeding ducks.

Damage. Its early migration in the autumn may bring it to the rice-fields of California and Arkansas before the crop is harvested, but it is very doubtful whether it ever does so much damage as the Mallard or the Pintail under similar conditions. The U.S. Biological Survey does not believe that it ever damages a crop or destroys animals which are of value to man. It does devour various fish predators such as dragon-fly nymphs, giant water-bugs, water-scorpions, etc., besides crayfish which are destructive to crops and to levees. It is unlikely also that it has much effect on the more valuable duck-food plants for it prefers dirty shallow water with a great density of animal and vegetable life.

Food Value. I know of no surface-feeding duck about the value of whose flesh

there is more divergence of opinion. I once knew an old epicure from Baltimore who considered himself an absolute authority on food and drink. At a certain shooting club he used to pick out for himself as a breakfast dish a young Shoveller still with pin-feathers in its plumage. Most American sportsmen consider this a fairly good bird for the table, although not equal to Mallard or Teal. Audubon almost goes into raptures in speaking of it, but he does the same for almost every other duck. Nevertheless there is plenty of evidence to the contrary, and it certainly never fetched a high price in the markets. The truth is that the Shoveller averages thinner than any of its relatives, and is seldom in really prime condition. The flesh when poor is not fishy in flavor, but rather muddy.

Among European sportsmen there is the same difference of opinion. Some consider it very good, others think it rather mediocre. But in India it seems to be universally despised, due no doubt to the very filthy nature of some of the village ponds on which it feeds. Both Hume and Marshall (1879) and Baker (1908) consider it one of the worst ducks. Undoubtedly it is strongly flavored there, due to the abundance of animal food provided by the warm winter climate. On the other hand there may be a large element of prejudice involved in the stigma cast upon it.

Hunt. What has been said on this subject in connection with other surface-feeders applies equally to the Shoveller, excepting that this species is much more easily stalked. It is not so easy to attract with bait because of its dislike for coarse grains; nevertheless it can be baited, as can some diving ducks, such as Golden-eye, Red-head and Canvas-back.

Behavior in Captivity. Generally speaking the Shoveller is a species poorly adapted for ornamental waters because it requires an abundance of minute aquatic life to keep it in health. If Shovellers are turned out on a small piece of water which has been crowded for several seasons with many kinds of ducks, the chances are that they will live for only a few months. Although often for sale in this country they are not particularly cheap, because the breeders lose a good many in the handling. Even those that survive transportation usually arrive in poor condition, as thin as crows, although perhaps in beautiful plumage. But if the proper conditions are available they can be brought into good condition and are then not especially hard to breed. They used to fetch from $15.00 to $20.00 a pair in this country, and in England usually from £1 to £2.

In Europe it has been kept and bred in many public gardens and private parks. The old birds seem to do well if conditions are reasonably good, but the young are delicate and require special care in feeding (Job, 1915; Blaauw, *fide* Hubbard, 1907). Mr. Wormald had a female bird which laid three clutches of eggs in the summer of 1922. Eighteen specimens kept in the London Gardens lived, on the

average, five years, the maximum being twelve years and ten months (P. C. Mitchell, 1911). Mr. H. B. Astley wrote me that he had had a male on his ponds for at least seven years in spite of the fact that there were few water plants for it to feed on.

An interesting note which seems to have first described the peculiar movement already discussed under Food and Courtship, was published by M. Brüggemann in the Zoölogischer Garten (1876, p. 195). He considers the Shoveller one of the least intelligent of all ducks and very stupid in captivity. Pairs of his birds would pick out a spot near shore and start the rotary swimming movement, gaining great speed and keeping it up for hours when left undisturbed. The male and the female used to do this in common, but single birds also engaged in it, and the observer came to the conclusion that this behavior had nothing to do with sexual activities, and was merely a ruse to bring to the surface all sorts of aquatic life.

An interesting characteristic showing the phlegmatic disposition of the bird was noted by Heinroth (1911). He says that when locked into a photographer's cage they did not flutter around in the senseless manner of many ducks but soon settled down and stood quietly awaiting developments. He noticed the same philosophical attitude of resignation in the Cinnamon Teal.

Hybrids. Although the Shoveller has produced hybrids with a comparatively large number of other species, both in the wild and in captivity, wild hybrids are by no means common. So far as I know only one has been described for America, and that was a cross between the Shoveller and the Blue-winged Teal (Deane, 1905a). In the Old World, hybrids between the Shoveller on the one hand, and the Mallard, Gadwall, Common Teal, Pintail and Garganey on the other have been recorded (Suchetet, 1896; Poll, 1911). In confinement the Shoveller has crossed with the Garganey, the Muscovy and the Carolina Duck (Poll, 1911; Millais, 1902; Wormald, 1914).

AUSTRALIAN SHOVELLER

SPATULA RHYNCHOTIS (LATHAM)

(Plate 48)

SYNONYMY

Anas rhynchotis Latham, Index Ornith., Suppl., p. lxx, 1801.

Rhynchaspis rhynchotis Stephens, General Zool., vol. 12, pt. 2, p. 123, 1824.

Spatula rhynchotis G. R. Gray, List Birds British Mus., vol. 3, p. 140, 1844.

Spatula variegata Gould, Proc. Zool. Soc. London, 1856, p. 51.

Rhynchaspis variegata Bonaparte, Compt. Rend. Acad. Sci. Paris, vol. 43, p. 650, 1856.

VERNACULAR NAMES

English: Australian Shoveller, New Zealand Shoveller, New Holland Shoveller, Shovel-nosed Duck, Blue-wing.

German: Australische Löffelente.

Maori: Kuruwhengi.

Aborigines of Australia: Bardoongooba.

DESCRIPTION

ADULT MALE: Occiput, area along base of culmen, and chin, nearly black; rest of head except an irregular whitish band between the bill and the eye, gray, with a bluish or greenish sheen. Mantle and shorter scapulars brown, with light edges to the feathers, except a few of the outer ones which are banded with white. The longer scapulars have a white shaft-stripe and some of them are pale blue on the outer web. Back, rump, upper tail-coverts and tail black, with greenish reflections. Sides of rump with a white patch. A whitish neck-ring seems to be present in very full-plumaged birds but is not seen in my specimens. Upper breast brown with black subterminal markings. Rest of lower surface rich chestnut, irregularly crossed with black bands, which are broader on the flanks. Under tail-coverts black. Outer wing-coverts pale blue except the last row which are broadly tipped with white, forming an anterior wing-bar. Speculum brilliant metallic green, tertials brown, primaries dark brown. Under wing-coverts, except the marginal ones, pure white; axillars white.

Iris bright or golden yellow. Bill black. Feet orange-yellow (Buller).

Wing 240–250 mm.; bill 60; tarsus 37.

Note: As Buller (1888) remarks, there seems to be a great deal of variation in the male plumage. In some specimens the white crescentic face-patches are indistinct, while in others they are broad and well defined and meet under the throat to form an irregular patch. The white on the upper part of the breast and sides of the neck also varies. This writer also describes some partial-albino specimens. One of these is said to resemble the male of the Common Shoveller.

ADULT FEMALE: Somewhat resembles the female of the Common Shoveller but is very much darker both above and below. The outer wing-coverts are bluer and the speculum is more brilliant.

Iris reddish brown. Bill dark brown. Legs and feet pale brown to yellowish.

Wing 237 mm.; bill 57; tarsus 36.

YOUNG IN FIRST (JUVENAL) PLUMAGE are said to be similar to the female but duller and darker. The young males according to Buller have the "punctations" on the sides more conspicuous.

DOWNY YOUNG: Specimens not available. Published descriptions do not compare this species with young of the Common Shoveller.

DISTRIBUTION

THE New Holland or Australian Shoveller is on the whole a rare bird and is practically confined to eastern Australia and New Zealand. It seems to be very rare or unknown in the central and western parts of Australia. Carter (1904) took one near Winning and heard of another taken on the Minilya River, in the vicinity of Northwest Cape. W. B. Alexander (1923) reported it from the Swan River region. It is also said to have occurred once on Lake Muir (Carter, in Mathews, 1914–15). In the southwest a specimen was taken near Hunter River, Bremer Bay (W. B. Alexander, 1916). There is no evidence of its presence in northwestern Australia nor in the North Territory of South Australia, excepting for the fact that S. A. White (1914) found it along the Finke River and on Lynds Creek, far in the interior. But it occurs in eastern Queensland and has been found breeding at Duaringa (Barnard, in North, 1913). Broadbent (1910) has recorded it from as far north as the Herbert River, but Berney (1907) says it is very rare about Richmond. Ramsay (1877) lists Wide Bay as among the localities where it is found.

Australia

In New South Wales its appearance seems to be very much subject to meteorological conditions, for it occurs only during the rains. It is rare in the northwest (D'Ombrain, 1921). North (1913) says it is fairly common on the Bogan, Macquarie and Lachlan Rivers, and he quotes Savidge as saying the same for the Ulmarra swamps. Cox and Hamilton (1889) state that it is rare in the Mudgee district. Ramsay (1877a) has recorded it for the Richmond and Clarence River district and R. Hall (1909) found the species breeding on the Murray. Sometimes it is present there in large flocks. In Victoria it nests commonly about Lake Boga (A. C. Stone, 1912), but it is said to be very rare in the vicinity of Melbourne (Batey, 1907). In the southeastern part of South Australia it is, in places, moderately common. S. A. White (1914) found a few near Dalhousie. He also found the species fairly common on Lake Alexandrina (*fide* Mathews, 1914–15). Mellor (*fide* Mathews, 1914–15), however, did not find it a common bird on Lakes Alexandrina and Albert.

Tasmania

Gould (1865) speaks of it as abundant in Tasmania and on the islands of Bass Straits, but this statement is contradicted by Legge (1905) who says it is nowhere plentiful in Tasmania and was only occasionally seen on Great Lake.

New Zealand

The Australian Shoveller has occurred outside of Australia in New Caledonia (Marie, 1877; E. L. and E. L. C. Layard, 1882). In New Zealand it is nowhere a common bird, and is not known from the northernmost parts of North Island (Buller, 1888). The species has been found on Auckland (Hutton, 1870; Buller, 1888) and on the Chatham Islands (Travers, 1872).

GENERAL HABITS

THIS Shoveller, which is very closely related to the Common Shoveller, is found in the brackish swamps near the coasts as well as the fresh-water lakes and lagoons of the interior of eastern Australia and New Zealand. So far as known, it does not differ in habits from other members of the genus. The general plumage pattern of the male reminds one very much of the American Blue-winged Teal and also of the Mallard.

WARINESS. Australian writers class this species as among the more wary of the ducks (North, 1913; R. Hall, 1909; A. C. Stone, 1912), but this is quite at variance

AUSTRALIAN SHOVELLER

Female Male

SOUTH AFRICAN SHOVELLER

Male

RED SHOVELLER

Female Male

with Buller's (1888) observations. The latter writer found it "far less suspicious than the Common Grey Duck, and easily approached and shot."

GAIT, SWIMMING, DIVING. The posture and carriage of this duck are very similar to those of our own Shoveller. Captain White's remark (in Mathews, 1914–15) that "they dive a lot for their food" on Lake Alexandrina, South Australia, seems to me very remarkable. No other writers mention such habits.

FLIGHT. All observers agree in describing the flight as rapid. Mellor (in Mathews, 1914–15) remarks that he could tell the Shovellers at night, while waiting for a shot at ducks, by the straight swoop and arrow-like rapidity with which they settle on the surface of the water. When they rise, their wings make a loud whirring sound much as in our own Shoveller. North (1913), and Hall say one "Blue-wing" will make as much noise as a score of other ducks. Like the Common Shoveller, this species usually travels in pairs or in small parties (Buller, 1888).

ASSOCIATION WITH OTHER SPECIES. There is no information on this point beyond Gould's (1865) old note that he "frequently met with it in company with other common ducks of the country, all united in one flock."

VOICE. No careful description of the voice has been published. Buller's (1888) statement that "when disturbed on the water it produces a low whistling note" is not sufficient to give an adequate idea of its call.

FOOD. As with our own Shoveller, exact analysis of stomach contents presents great difficulties, because much of the organic matter taken in is so formless and minute that in the stomach it soon becomes a mass almost impossible to identify. Buller (1888) states that these ducks feed on minute fresh-water mollusks, aquatic insects, tender herbage and the seeds of the *toetoe* and other plants. On examining stomachs he found "a mass of comminuted substances of a greenish color, among which could be distinguished fragments of vegetable matter, seeds, the remains of insects, and numerous small pebbles of white chalcedony."

COURTSHIP AND NESTING. There are no notes on the display which most probably is the same as in the Common Shoveller. A form of play, perhaps connected with courtship, is mentioned by R. Hall (1909) in which "the males rise very quickly, fifteen to twenty feet directly above where they were swimming and then immediately fall back to their original position."

The nesting season in eastern Australia extends from August to November or December (North, 1913). The only nest hitherto described from New Zealand was

found on November 7 (Potts, 1871) though Buller (1905) speaks of some birds that hatched out their broods near his place for three years, the time of hatching being late November.

From the nests hitherto described I should say that they present no peculiarities. They are loosely constructed and placed in the grass near the water, or occasionally on the open plain. One nest found in Australia was in the top of a hollow stump of a dead box-tree, the eggs resting on the decaying wood (North, 1913). The clutch varies in number from seven to eleven, the maximum recorded being thirteen (Buller, 1888). The eggs are creamy white in color, faintly tinged with green (North, 1913). The measurements of twenty eggs cited by North average 51.56 by 37.34 mm., the lengths varying from 49.5 to 55.4 and the widths from 36.1 to 38.6 mm.

Status. Reference to the distribution will show the general rarity of this duck. It is said to have decreased from a fairly plentiful to a scarce species in the Ulmarra Swamp region, New South Wales (Savidge, in North, 1913), and I presume its decrease in Australia has been general. One of my correspondents from the interior of South Australia does not even mention it. Potts (1871) says that the markets of Wellington, New Zealand, used to receive many from Hawke's Bay, but that in recent years this supply has failed. On the other hand he thought the species more common than formerly in the South Island, on Lake Ellesmere and the mountain lakes of the Ashburton country.

Enemies. Nothing known beyond what has been said under the Australian Black Duck.

Damage. None recorded.

Food Value. The flesh is not always first-class, and is generally rated as somewhat inferior to that of the Australian Black Duck or the Teal (Gould, 1865; White, in Mathews, 1914–15; North, 1913). Mr. Charles Barrett writes that in Victoria it is favored as a table bird and the "poulterers' shops" sometimes have good supplies.

Hunt. An interesting note on primitive methods used by the Queensland aborigines for taking this and other species of ducks is quoted by North (1913) from a letter received from Dr. W. E. Roth. "Ducks and cranes may be caught with sticks, etc., in the nesting season, by sneaking upon them unawares. The natives of the upper Georgina River, and in the Boulia district, noose ducks with a long slender stick, to the extremity of which a feather quill with slip-noose is attached. The hunter, well concealed with bushes tied around his head and face, waits

MAP 68. Distribution of Australian Shoveller (*Spatula rhynchotis*)
Sporadic records indicated by crosses (×)

patiently in the water for his prey, which paddling along the water soon comes into suitable position for the loop to be slipped over its neck.

"In the hinterland of Princess Charlotte Bay, on the Palmer River, etc., ducks, geese and similar game are all stalked and speared — usually with ordinary simple point spear if on land, but commonly with a pronged one in water. In either case the aboriginal covers his head with long grass, tied about near to its extremities into something like a horse collar, the ends falling over on to the back of the wearer's shoulder . . . viewed from the front the individual so concealed looks for all the world like a tussock of grass floating down the stream, so slow and silent are his movements. If ducks are being hunted out on the plains, the black does not trouble about holding the leafy screen in front of him, but stalks his prey more or less on all fours, under cover of any intervening bushes. On the Pennefather, Embley and Tully Rivers, ducks and geese may be knocked over with long thin switches, both by day and by moonlight. The Pennefather natives, in addition, will build special bush shelters in the lagoons, and hiding under cover will wait there for hours for a favorable strike with their spears. In the neighborhood of the Laura River, also at Cape Bedford and elsewhere, ducks can be caught by silently diving under them in the water, and pulling them down."

Behavior in Captivity. These birds have been kept in the Zoological Gardens of Melbourne, but they never bred there (D. Le Souef, *in litt.*). They have never been imported into Europe or America.

Hybrids. A wild hybrid between this species and the Gray Teal (*Anas gibberifrons*) has been described by Zietz (1912).

RED SHOVELLER

SPATULA PLATALEA (VIEILLOT)

(Plate 48)

SYNONYMY

Anas platalea Vieillot, Nouv. Dict. des Sci. Nat., vol. 5, p. 157, 1816.

Spatula platalea Boie, Oken's Isis, 1826, p. 980.

Rhynchaspis maculatus Jardine and Selby, Illustr. of Ornith., vol. 3, pl. 147, 1835.

Rhynchaspis maculata Hartlaub, Verzeichniss nat.-hist. Sammlung Ges. Mus., p. 120, 1844.

Spatula rhynchotis G. R. Gray (in part), List Birds British Mus., vol. 3, p. 140, 1844.

Dafila cœsioscapula Reichenbach, Synopsis Avium, Natatores, pl. 51, fig. 180, 1845.

Dafila cœsioscapulata Bibra, Denkschr. Akad. Wiss. Wien, vol. 5, p. 131, 1853.

Rhynchaspis mexicana Lichtenstein (*nec* Gmelin), Nomenclator Avium, p. 102, 1854.

Rhynchaspis platalea Bonaparte, Compt. Rend. Acad. Sci. Paris, vol. 43, p. 650, 1856.

Spatula maculatus Gould, Proc. Zool. Soc. London, 1856, p. 95.

VERNACULAR NAMES

English: Red Shoveller, South American Shoveller.

German: Südamerikanische Löffelente.

Spanish: Pato espatula, Pato cuchara, Pato de cangrajal, Pato silvestrè, Pico de enchara.

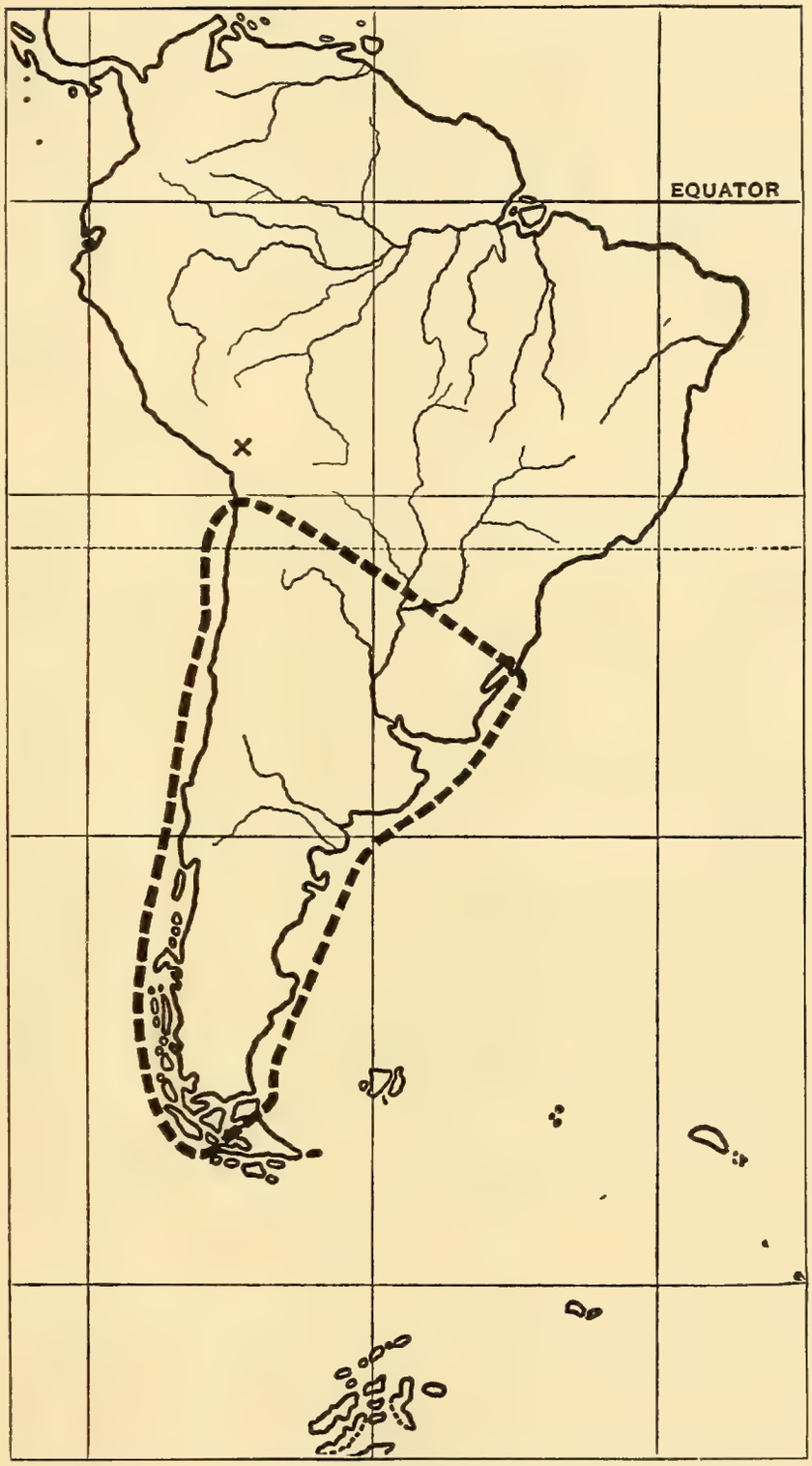
DESCRIPTION

ADULT MALE: Head pinkish buff with fine blackish spots, except the chin, which is white and nearly immaculate, and the mid-occipital region, which is darker. Mantle and scapulars reddish with many oval black markings; the long scapulars highly ornamental, metallic black with light central shaft-stripes. Back and rump nearly black and without the pattern of the rest of the upper surface. Upper tail-coverts black; tail brownish gray, with light edges to the feathers. Breast and abdomen rich chestnut to blackish chestnut, always darker posteriorly, and the whole lower surface spotted with black. Under tail-coverts black. Sides of rump with a conspicuous white patch as in the Common Shoveller. Wing almost as in the Common Shoveller. In some specimens, apparently old males in very rich plumage, the black spots on the lower abdomen can scarcely be made out and there is always a good deal of variation in the intensity of the color on the lower surface.

Iris whitish to white in the breeding season and said to be hazel-brown at other times. Bill black, or black shaded with dark green. Legs and feet yellow to orange-yellow.

Wing 210–222 mm.; bill 66; tarsus 49.

Note: There is no eclipse plumage.



MAP 69. Distribution of Red Shoveller (*Spatula platalea*)
Sporadic record indicated by cross (×)

Adult Female: Exactly like the female of *Spatula clypeata* in color, but slightly smaller.

Iris brownish to brown. Bill brownish black to blackish. Legs and feet grayish to yellowish. Wing 195–209 mm.; bill 59; tarsus 32.

Young Female in First (Juvenal) Plumage: Resembles the adult but probably has the mantle more uniform in appearance.

Young Male in First Plumage: Resembles the young female, but the blue of the wing-coverts is brighter, and the legs and feet are said to be of a more brilliant coloring.

Young in Down: Not available.

DISTRIBUTION

The range of the Red Shoveller does not differ greatly from that of many other South American shoal-water ducks. In the north it has been found as far as Peru, at Tungasuca (P. L. Sclater and Salvin, 1876a). When Lord William Percy was in western Bolivia in May, 1920, he took three specimens and saw others on the Desaguadero River, eighty miles above Lake Poopo at an altitude of about 11,000 feet. It is found in the Bolivian Chaco, near Tarya (Lönnberg, 1903). Kerr (1892) met with it on the lower Pilcomayo, and it is found throughout northern Argentina. Lönnberg (1903) found it in Jujuy and Lillo (1902) has recorded it from Tucuman. It occurs also in Rioja (Giacomelli, 1907) and in Cordoba (Frenzel, 1891; Schulz, *fide* Dabbene, 1910). In parts of Mendoza it is common (C. S. Reed, 1916). Farther east, C. H. C. Burmeister (1861) met with it on the Paraná, and it is found also in Rio Grande do Sul, southeastern Brazil (H. and R. von Ihering, 1907). In Uruguay, according to Barrows (1884), it is the commonest duck on the salt ponds of Puan and Carhue. Tremoleras (1920) has recorded it for Montevideo and Canelones.

Peru

Bolivia

Argentina

Uruguay

In Buenos Aires Province it is a fairly common resident, and breeds (P. L. Sclater and Hudson, 1889; Hartert and Venturi, 1909; C. H. B. Grant, 1911; E. Gibson, 1920). Mr. J. L. Peters (MS.) found it locally common in northwestern Patagonia, and Durnford (1877, 1878) says it is resident and common in central Patagonia. Specimens have been taken as far south as the Straits of Magellan (P. L. Sclater and Salvin, 1878) and northern Tierra del Fuego (Blaauw, 1916a). P. L. Sclater and Salvin (1873) stated that the species occurs in the Falklands.

In Chile it is resident (James, 1892), but is rare in the south, though abundant in the central parts (Quijada, 1910). Waugh and Lataste (1894) say it is a common game-bird near Santiago. Lane (1897) found it on the Rio Pilmaiguen and the British Museum has a specimen from Tarapacá. It is probably also rare in northern Chile.

Chile

GENERAL HABITS

Very little has been written about this duck, which as far as its intimate habits are concerned, apparently differs in no respect from the Common Shoveller. It is a much more common bird than the Australian or the Cape Shovellers, and like them it has no eclipse plumage. Its haunts are like those of the other Shovellers, for it prefers brackish lagoons and shallow inland waters adapted to its peculiar mode of feeding.

Concerning its seasonal movements little can be said, so scanty is our information. Like all the shoal-water ducks of the Argentine it is both local and migratory over the whole of its range excepting at the extremities, where it is chiefly, if not entirely, migratory. In Uruguay in the north it arrives in great numbers early in

April to spend the winter (Barrows, 1884). When Mr. J. L. Peters was in northwestern Patagonia (Rio Negro) in 1920, the species was first seen by him on October 9, and soon after it became common. Apparently it was strictly a migrant and breeder there. In November, 1920, near Lavalle, Buenos Aires, Dr. Wetmore (MS.) noted a few males appearing in a great migration of male Brown Pintails, which had apparently left their females and were seeking summer moulting places.

Wariness. This is one of the least wary of South American ducks (P. L. Sclater and Hudson, 1889; E. Gibson, 1920).

Daily Movements. Nothing recorded.

Gait, Swimming, Diving. Mr. Peters (MS.) generally found the Red Shoveller feeding close to the shore without "tipping up." He did, however, on November 16, watch three males and a female "tipping up," the males in this attitude displaying their brilliant orange-colored legs. He never saw them dive.

Flight. The flight is like that of other Shovellers, — rapid, darting and somewhat noisy when rising. Like other South American ducks they are seen in pairs more or less throughout the entire year. These pairs often bunch together into companies of twenty or thirty (P. L. Sclater and Hudson, 1889) and in winter great flocks of one to two hundred have been seen (A. H. Holland, 1892; Barrows, 1884).

Association with other Species. Mr. Peters (MS.) notes that single specimens associate with Brown Pintails but the flocks usually keep to themselves, and contain no other species of duck.

Voice. This must be a very silent bird, as are the other Shovellers, for neither Mr. Peters nor Dr. Wetmore, who paid particular attention to field observations, makes any mention of the note. In fact the only writer who makes any remarks about it is that pioneer in the field of Argentine ornithology, the late Mr. Hudson. "When disturbed or flying," he says, "the male emits a low sputtering sound, and this is its only language." I must confess that this does not enlighten us much.

The trachea of the male, apparently hitherto undescribed, is 125 mm. in length and slightly larger in the lower third of its course. The bulb is small, but somewhat bi-lobed, the lobes being globular in shape and the space between them a trifle constricted. This expansion faces to the left and forward, and measures 16 mm. by 10 mm. across.

Food. Nothing recorded.

COURTSHIP AND NESTING. Seven males collected by Mr. R. H. Beck at Mar del Plata, Buenos Aires, in September and October, showed the sex organs "large" in five and in "breeding condition" in the others. Five females collected from September 21–24 were labeled as having sex organs either "swelling," "large," or "ready to breed." Presumably the species nests in October and November, for by mid-December many flightless individuals were seen by Peters near Neluan in northwestern Patagonia.

The nest differs in no respect from that of other Shovellers. It is placed on dry ground near the water and is made of dried grass and lined with down. The eggs are seven in number, and of a creamy color (A. H. Holland, 1897). Specimens of eggs in the British Museum measure 49–57 by 35–36 mm. (E. Gibson, 1920).

STATUS. This is not an uncommon species. In Uruguay, in fact, it is described as the most plentiful duck in winter (Barrows, 1884). It is, of course, everywhere less common than the Brown Pintail or the Chilian Widgeon. In northwestern Patagonia it comprised about one to two per cent of the eleven species of ducks found there, equalling in number the Yellow-bill and Cinnamon Teals (Peters, MS.).

ENEMIES. The enemies are those discussed under *Anas spinicauda.*

FOOD VALUE. This duck does not enjoy a high reputation as a table bird. E. Gibson (1920) says it is the "least popular of the duck family from the edible point of view, being spare in flesh and rank in flavor."

BEHAVIOR IN CAPTIVITY. The Red Shoveller has never reached North America or Europe in a live state.

SOUTH AFRICAN SHOVELLER

SPATULA CAPENSIS (EYTON)

(Plate 48)

SYNONYMY

Rhynchaspis capensis Smith, Cat. South African Mus., p. 36, 1837 (*nomen nudum*); Eyton, Monograph Anatidæ, p. 135, 1838.

Spatula clypeata G. R. Gray (in part), List Birds British Mus., vol. 3, p. 139, 1844.

Spatula capensis G. R. Gray, Genera Birds, vol. 3, p. 618, 1845.

Anas clypeata Schlegel (in part), Mus. Pays-Bas, Anseres, pp. 33, 34, 1866.

Anas capensis Giebel (in part), Thesaurus Ornith., vol. 1, p. 348, 1872.

Spatula smithii Hartert, Kat. Vogelsamml. Mus. Frankfurt, p. 331, 1891.

VERNACULAR NAMES

English: Cape Shoveller, South African Shoveller.

German: Südafrikanische Löffelente.

Dutch: Slop; Kaapse Slop.

DESCRIPTION

ADULT MALE (specimen in collection of J. H. Fleming, Toronto): General appearance like the male of the Australian Shoveller, but the head is lighter colored and never has any bluish sheen, while the lower parts have scarcely any chestnut tinge. It resembles very closely the female of the Australian species, but differs from it in the bluer wing-coverts, the broader band of white anterior to the speculum, and the bluish-metallic color at the ends of the outer secondaries. Except for the brilliant wing this is a brown-colored duck both above and below, the breast having strongly marked dark-brown V-shaped bars. The occiput is dark brown, but the edges of the feathers are gray. The sides of the head and upper neck are buffy gray with minute dark-brown streaks. The chin and throat are nearly immaculate buff.

"Iris, lemon-yellow; bill, deep reddish-brown, almost black; legs, toes and webs, ochry-yellow, but the latter are dusky towards the extremity" (Andersson).

Wing 244 mm.; bill 62; tarsus 41.

FEMALE: Similar to the female of *Spatula clypeata* according to Salvadori, but easily distinguished by the blue tinge of the speculum. Besides this it has the tail much darker brown, with irregular rufescent bars.

IMMATURE IN FIRST (JUVENAL) PLUMAGE: Upper side, particularly the mantle, much more uniform than in the adult and barred with wavy light lines in place of the dark rounded spots. Lower surface indistinctly barred with irregular darker markings and not coarsely streaked as in the adult (British Museum specimens).

MAP 70. Distribution of South African Shoveller (*Spatula capensis*)
Sporadic record indicated by cross (×)

DISTRIBUTION

The Cape Shoveller seems to be confined to South Africa. In the west it has been found as far north as Rio Coroca, Mossamedes (Barboza de Bocage, 1877–81), but in Damaraland and Great Namaqualand it is comparatively scarce (Andersson, 1872). In Cape Colony it has been met with in the Cape Division, at Verloren Vlei, on Berg River and on Vogel Vlei, in Paarl, Knysna (Layard, 1875–84). Rickard (in Layard, 1875–84) has recorded it from Port Elizabeth, and Griffith (*ibid.*), who says it is rare in the eastern part of Cape Colony, met with it at Queenstown. C. G. Davies (1908) has recorded it from eastern Griqualand. Ayres (British Museum) met with the species at Durban, Natal, and E. A. Butler, Feilden and Reid (1882) saw a pair east of Newcastle. Murray (Stark and Sclater, 1906) found it near Mafeteng in Basutoland. B. Horsbrugh (1912) says he has several times shot specmens in the Orange River Colony, especially near Bloemfontein. He never found the species in the Transvaal, though Ayres (*fide* Stark and Sclater, 1906) has recorded it from there. There are no records for Rhodesia, but Bryden (1893) came across it on the Botletle River, Bechuanaland.

Perhaps single specimens sometimes straggle to the northeast. Lefébvre's statement (Voy. Abyss., Oiseaux, p. 172, 1845–50) that it occurs in Abyssinia gains color from B. Horsbrugh's (1912) assertion that he shot a fine male from a flock of European Shovellers in British East Africa.

GENERAL

This, the last and by far the rarest and least known of the Shovellers, has a very restricted range, almost as limited as that of the South African Sheldrake. B. Horsbrugh (1912) is of the opinion that it is a bird of shy and wary habits; but this, I think, may refer to its retiring nature rather than to its actual wildness, for none of the Shovellers can be called exactly wild or wary. Practically nothing is known of the life-history of this species. Horsbrugh found them always in pairs, and noted that their manner of feeding was exactly the same as that of the Common Shoveller. He also observed the curious trick of swimming swiftly round and round in small circles in shallow water, all the while sifting mud and small insects stirred up by the rotary action. He considers them much faster on the wing than the Yellow-billed Duck or the South African Pochard, and says they would come through flocks of the latter "like race-horses."

Of the nesting habits we know nothing beyond the fact that a set of eggs taken on the Berg River are of a delicate cream color tinged with green, and measure 54.9 by 38.1 mm. (Layard, 1875–84).

The Cape Shoveller has never been imported alive into Europe or America.

PINK-EARED DUCK

MALACORHYNCHUS MEMBRANACEUS (LATHAM)

(Plate 49)

SYNONYMY

Anas membranacea Latham, Index Ornith., Suppl., p. lxix, 1801.

Anas fasciata Shaw, Naturalist's Misc., vol. 17, pl. 697, 1790–1813.

Rhynchaspis membranacea Stephens, General Zool., vol. 12, pt. 2, p. 124, 1824.

Malacorhynchus membranaceus Swainson, Journ. Royal Inst. Gt. Britain, vol. 2, no. 4, p. 18, 1831.

Malacorhynchus fasciatus Wagler, Oken's Isis, 1832, p. 1235.

Malacorhynchus membrinaceus Eyton, Monograph Anatidæ, p. 136, 1838.

Malacorhynchus iodotis Lesson, Descrip. Mamm. et Oiseaux, p. 246, 1847.

Anas malacorhyncha Schlegel (*nec* Gmelin), Mus. Pays-Bas, Anseres, p. 36, 1866.

Malacorhynchus malacorhynchus Hartert, Kat. Vogelsamml. Mus. Ges. Frankfurt, p. 232, 1891.

Malacorhynchus membranaceus assimilis Mathews, Austral Avian Record, vol. 1, p. 86, 1912.

VERNACULAR NAMES

English: Pink-eared Duck, Pink-eyed Duck, Whistling Duck, Membranaceous Duck, Zebra Duck, Widgeon (Victoria).

German: Rotaugenente.

Aborigines of Australia: Gewallert, Wymbin.

DESCRIPTION

ADULT MALE: Forehead whitish, shading into gray on the crown, a large patch of blackish brown around and below the eye, extending backward along sides of crown to the nape. On each side of the head behind the eye is a light pinkish spot. Lores, throat and a narrow eye-ring white. Sides of face, neck, upper mantle, breast and flanks white or buffy white, regularly barred with dark brown. On the abdomen and under tail-coverts the bars are narrow or obsolete. Lower mantle dark brown with irregular buff-colored bars. Scapulars and upper wing-coverts brown, finely vermiculated with buff. Wings slate brown with a wide white band at the tips of the secondaries. Inner primaries also tipped with white. Rump and upper tail-coverts blackish, but a wide white band across the tips of the latter feathers. Tail dark brown to blackish, the feathers tipped with a white band.

Bill and feet slaty blue; iris brown (Mathews).

Wing 181–195 mm.; culmen 62–68; tarsus 35–44.

Weight from one half to three fourths of a pound (0.22 to 0.34 kilogram).

ADULT FEMALE: Similar in plumage to the male and only distinguished by the smaller size.

Wing 177 mm. (plus?); culmen 57 (plus?); tarsus 31 (plus?).

Note: I have not been able to study either the juvenal stage or the downy young. Specimens are still few in European, and especially in American, collections.

PINK-EARED DUCK

DISTRIBUTION

THE present species is a moderately common bird, confined to Australia, where it is generally distributed. In West Australia it is not common, but has been found in the vicinity of Point Cloates and Northwest Cape and in northwest Australia along the Fitzroy River (Keartland, in North, 1898; Carter, 1904). Also on Lake Muir, southwestern West Australia (Carter, Emu, 1923, p. 137). Eylmann (1911) found it on the North Peninsula and on the lakes of the interior of the North Territory, where it was fairly common. S. A. White (1914) took a pair at the mouth of the Finke River, in the MacDonnell Range, and Ingram (1907) has recorded it from the Alexandra district. It seems to be more abundant in eastern Australia, appearing with the rains, as most ducks do in that region. On the Cloncurry River, in northwestern Queensland, it is found in great numbers and breeds (Macgillivray, 1914), but on the Herbert River, northeastern Queensland, it is not common (Boyd, in North, 1913). The same is true of the Richmond district (Berney, 1907). Lyons (1902) says it was found all along the Diamantina River, but nowhere in large numbers, and Mr. C. T. Barnard writes me that it is so rare a bird near Duaringa that he has no notes on the species. Ramsay (1878) has recorded the species for Port Denison and Wide Bay. **Australia**

In New South Wales this duck is tolerably common after the rains; perhaps most so in the western parts (Ramsay, 1876; North, 1913). In Victoria it is very common when the conditions are suitable (A. C. Stone, 1912; Batey, 1907) and in South Australia it is found far in the interior (Lake Frome district) though on the lower Murray it is scarce (T. P. Belchambers, *in litt.*). Lyons (1902) says it was found on Lake Eyre. S. A. White (1917) found a few breeding on Cooper Creek. Mr. L. Reese writes me from the Marree district in the interior, that in flood years like 1920 this species nests there in considerable numbers. Chenery (in North, 1913) found the Pink-eared Duck breeding at Port Augusta. Further records of its distribution will be found in the pages of the "Emu."

In Tasmania the species is rare and irregular in its appearance (Gould, 1865; Legge, 1887). **Tasmania**

GENERAL HABITS

ALTHOUGH the Pink-eared Duck resembles the Shovellers in its feeding habits, it cannot be considered as related to that group. Generally speaking it is a rare bird, excepting perhaps in the interior of southeastern Australia. It is entirely a fresh-water bird, is never seen on the coast, and shows a decided preference for open, shallow lagoons with muddy bottoms. Very little is known about its life-history.

WARINESS. All writers agree in describing this duck as one of the very tamest, perhaps *the* tamest of Australian water-fowl. It allows a very close approach, and when flushed flies only a very short distance. Austin (in North, 1913) classes it as much the tamest of all the ducks, and says that it seldom flies high, so that a great many are shot. He has known a flock to fly round and round a lagoon till they were all killed. The species does not seem to have gained in wisdom from its contact with man, since the latest writers as well as the earliest speak of it as ludicrously tame (Gould, 1865; Berney, 1907; Austin, in North, 1913; Eylmann, 1911). In a recent letter to me Mr. Charles Barrett of Victoria speaks of them as "confiding" and "apt to evince curiosity rather than fear, when approached by a boat."

DAILY MOVEMENTS. No information.

Gait, Swimming, Diving. Nothing characteristic recorded.

Flight. The flight is described by Gould (1865) as very rapid, but there is no further information concerning it. The fact that it was once called "Whistling Duck" may have reference to a noise made by the wings. These are not social birds, and are usually seen in pairs or in small flocks of four or five. Gould (1865) noted flocks numbering from six to twenty, and Berney (1907) speaks of twenty-five as the greatest number he ever saw. Mr. Charles Barrett writes me that occasionally fairly large companies are seen in Victoria. The same is true for New South Wales, Moree district (F. C. Morse, 1922).

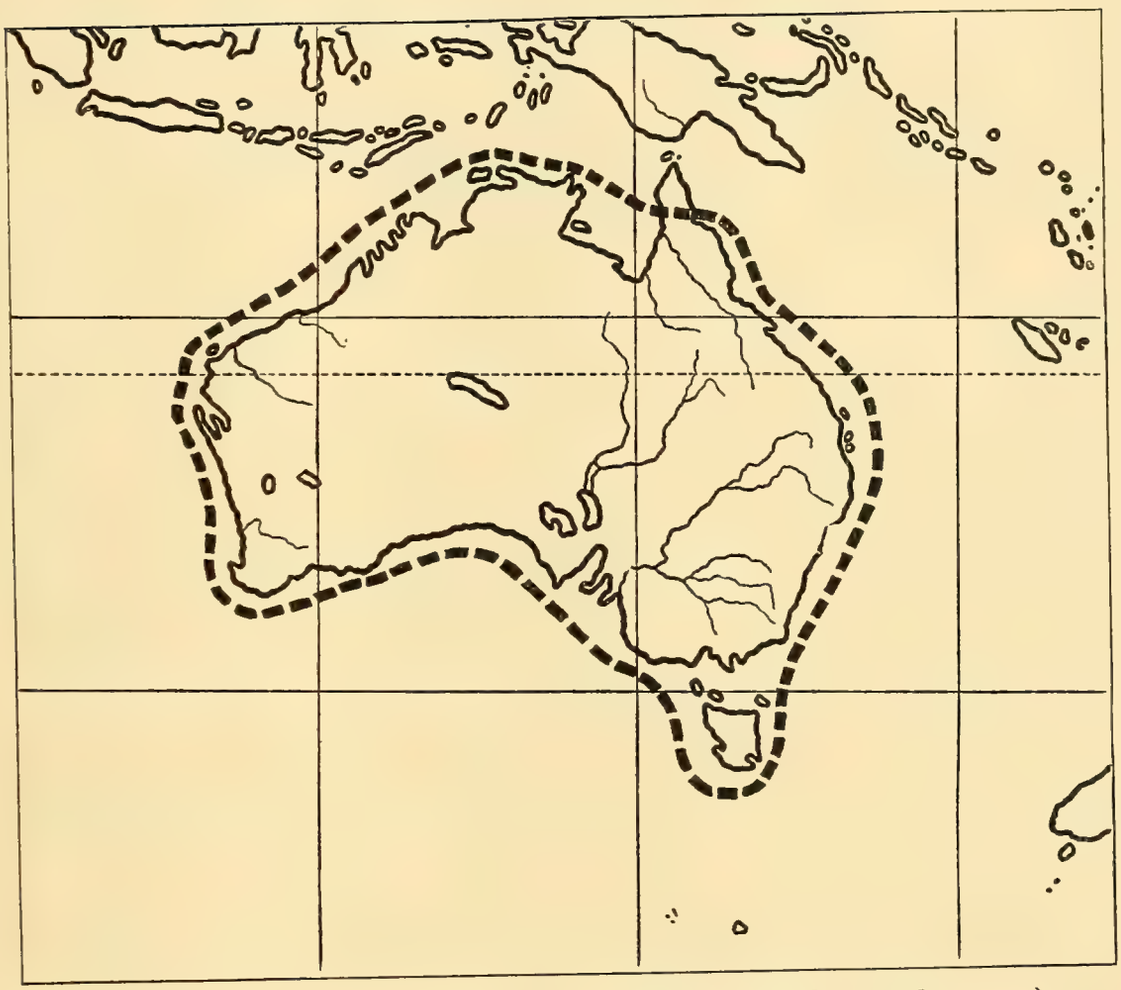
Association with other Species. These ducks probably associate very little with other kinds, least of all in the breeding season, for their nesting habits are peculiar. Sometimes they mix with Teal.

Voice. Like the true Shovellers this species seems to be rather silent. At any rate its voice has never been properly described, although Berney (1907), speaking of a flock feeding, says they "kept up a subdued running conversation in their soft musical notes." In a letter to me Mr. Barrett of Victoria says that they are favorites with bird lovers, who delight in watching them and listening to their "musical whistling notes."

Food. No study of the diet has been made. The food probably consists largely of very minute animal matter. Le Souef (Berney, 1907) found in the stomach of one specimen vegetable matter and fresh-water shells.

Courtship and Nesting. The Pink-ear may nest at any time of the year, though in southeastern Australia the months from August to December constitute the chief breeding season. Like other Australian ducks they usually breed when a long drought is broken by floods. Nests have been found in July and in April, and as late as January (Ramsay, 1876; North, 1913).

So far as known this little duck always chooses an elevated position for its nest. Many of those hitherto described have been placed on the abandoned stick nests of ibises and herons and in those of gallinules, coots or even hawks or crows. They seem to be particularly fond of nests of the Straw-necked Ibis (*Carphibis spinicollis*) usually placed in polygonum swamps or in high-rush swamps. In such places they pad the rough nests with their own down. They also nest in hollow trees, sometimes twenty to thirty feet above the water, or on top of stumps standing in the water. I have a photograph sent me by Mr. Charles Barrett of a nest-hollow in a large "canoe tree" about three feet above water in a flooded part of the Murray River.



MAP 71. Distribution of Pink-eared Duck (*Malacorhynchus membranaceus*)

The hollow seems to have been formed by natives cutting a slab of bark for a canoe many years ago. The nest itself seems to be entirely formed of a mass of dark slaty-gray down, of which a remarkably large amount is used. The eggs are concealed by a thick layer of this down, and appear to be quite immune from the attacks of ravens or crows.

The clutch numbers six to eight or even nine; the eggs are oval in form and pale creamy or yellowish white in color. They measure about 45 by 32 mm. (North, 1913).

Mr. Barrett writes me that the nest when in a hollow is sometimes betrayed by a feather caught in a splinter. While he was examining one clutch, the owners swam about quietly one hundred yards from the stump. He adds that he found it useless to seek for nests by watching the birds, for they seemed to keep away from all the likely places.

Status. An idea of the general scarcity of the bird may be obtained from the account of the distribution. Its appearance is so irregular and sporadic that no accurate idea of its numbers can be obtained. It is certainly most common in New South Wales, Victoria, and the eastern parts of South Australia. Writing me from the Marree district (interior of South Australia), Mr. L. Reese says that in the great breeding year of 1920 the Pink-eared Ducks nested there in numbers. He ranked them with the Australian Black Duck, Gray Teal and Whistling Tree Duck.

The elevated position of the nest may protect the eggs from raids of the various introduced mammals that have raised such havoc with Australian ground-nesting birds. The actual status has probably not changed much, at least in the interior.

Sportsmen are not especially keen on shooting them, at least when better ducks are available, so they seem to be in little danger of extinction at the present time.

Food Value. Berney (1907) considers it dry and poor eating, and says its small size protects it from extensive slaughter. Mr. Barrett describes the flesh as "not very palatable."

Behavior in Captivity. The Director of the Melbourne Gardens, Mr. D. Le Souef, writes me that Pink-eared Ducks have been exhibited there but never showed any inclination to breed. He does not think they have ever bred anywhere in confinement. Mr. Blaauw, who has had nearly all obtainable ducks on his estate at Gooilust, Holland, told me that he had never succeeded in importing it. No hybrids have ever been recorded.

CAROLINA DUCK

LAMPRONESSA SPONSA (LINNÉ)[1]

SYNONYMY

(Plate 50)

Anas sponsa Linné, Systema Naturæ, ed. 10, vol. 1, p. 128, 1758.

Aix sponsa Boie, Oken's Isis, 1828, p. 329.

Dendronessa sponsa Swainson and Richardson, Fauna Boreali-Amer., vol. 2, p. 446, 1831.

Lampronessa sponsa Wagler, Oken's Isis, 1832, p. 282.

Aia sponsa Eyton, Monograph Anatidæ, p. 120, fig. 1, 1838.

Cosmonessa sponsa Reichenbach, Avium Syst., Natatores, p. x, 1852.

Aix promissa Brehm, Naumannia, 1855, p. 298, in synonymy of *Aix sponsa*.

Dendrocygnus sponsa Brewer, Proc. Boston Soc. Nat. Hist., vol. 7, p. 308, 1860.

Aex sponsa British Ornith. Union List British Birds, p. 123, 1883.

VERNACULAR NAMES

English: Carolina Duck, Wood Duck, Summer Duck, Bride Duck, Rainbow Duck, Regal Duck, Acorn Duck, Squealer, Scovy Duck, Widgeon, Wood Widgeon, Crested Wood Duck, Tree Duck.

French: Canard carolin, Canard de la Caroline, Canard huppé, Canard branchu, Branchier, Canard du bois, Canard d'été.

German: Brautente, Karolinenente, Sommerente, Waldente, Luisianische Haubenente.

Dutch: Carolina-eend.

Spanish: Pato de la Carolina, Huyuyo (Cuba).

Italian: Sponsino.

Mexican: Iztactzonyayauhaui.

Ojibway Indians: Chiship, Mistigúnk, Akósa.

DESCRIPTION

ADULT MALE: Head with long, full crest, colored with green and purple metallic reflections and containing white feathers. Chin, throat, neck, and a semi-lunar patch extending up behind the eye, white; sides of head black; upper breast claret-color with white spots; rest of lower parts white. Flank feathers straw-colored, finely vermiculated with black, and tipped with white and black bars. On the sides of breast a conspicuous black and white bar. Mantle, back, and rump bronzy green, scapulars mostly purplish black. Upper wing-coverts gray, lower ones purple metallic. Secondaries metallic green with a white line at their tips. Tertials broad and velvety black tipped with white, but

[1] As these pages go to press, Miller (1925) shows that *Aix* is the generic name for this species.

Male MANDARIN DUCK Female

Male CAROLINA DUCK Female

the outer one coppery red on outer web. Primaries gray, tipped with metallic blue, and on the outer web silvery white. Tail greenish black, the feathers wide and rounded.

Bill yellow at base, passing to a dark red area which extends forward as a line along edge of culmen. Remainder of culmen whitish except a large black patch between the nostrils and the whole of the nail. Lower mandible black. These colors, especially the red, fade more or less after the breeding season. Legs and feet dull yellowish to chrome yellow with the webs and joints blackish. Iris bright orange-red; in spring carmine-red, fading somewhat in summer. Eyelid crimson.

Wing 450–485 mm.; culmen 35; tarsus 35.

Weight up to 1 pound, 15 ounces (0.89 kilograms).

Adult Female: Plain-colored all over except for metallic reflections on upper side and metallic-blue secondaries. The upper surface is olive-brown; under parts white; flanks brown; chin and throat white, as well as a ring around the eye and a line along base of culmen. The white eye-ring extends back as a posterior white eye-patch. Occiput metallic greenish to copper-colored; axillars barred. In captivity old females have been known to assume almost complete male plumage, as often happens in other species of ducks (Finn, 1916a).

The female cannot be confused with any other duck save the female Mandarin, from which it may be distinguished by its wide white peri-ocular ring, darker occiput, barred axillars, and the absence of a very distinct white band along base of culmen.

Iris dark brown and edge of lid bright yellow. Bill black. Feet darker than those of the male.

Wing 230 mm.; tail 103; bill 30; tarsus 32.

Weight when fat, up to 1 pound, 7 ounces (0.65 kilograms).

Immature (Juvenal) Male: Very much like eclipse of old male, but the white on throat and cheeks less well developed. The whole of the lower parts, including the abdomen and under tail-coverts, is streaked and spotted with brown, and the tail-feathers are blunt at the tips.

Young males can be told from females of similar ages by the presence of the white V-shaped patches on the face and neck.

Immature (Juvenal) Female: In the first feather the female shows no white line at the base of the bill and a poorly marked peri-ocular white patch. The light streak above the eye and the post-orbital dark streak (remains of downy plumage) are still visible. At a later stage the white eye-patch appears and sometimes a considerable area of dirty white on the lores. The under parts are mottled as in the young male. At the age of six or seven weeks, even before the primaries are fully developed, the females are easily separated from the males by the absence of the white V-shaped patches below the eye and on the sides of the neck. The first tail-feathers are blunt at the tips.

Young Male in Autumn: Changes to adult plumage are sometimes visible in young of the year by the second week of September. These consist of a few wine-colored feathers on the breast, vermiculated flank feathers, and dark purple scapulars. Some new tail-feathers may appear at this time. Progress to maturity is rapid after the beginning of October, but the young male is at least a month behind the old male in attaining winter plumage. Captivity-bred birds are somewhat later than wild ones.

Male in Eclipse Plumage: In this plumage there is a superficial resemblance to the adult female but the white V-shaped patches on the cheeks and sides of the neck are always prominent. The abdomen is no longer white but more or less mottled and streaked with brown. The peri-ocular white eye-patch and the white line at the base of the bill of the female are both practically absent. A small blackish or metallic-green patch is apt to be retained between the eye and the base of the culmen. Males begin

to lose winter dress in our northeastern States in mid-June (earlier in the South and in California) and are in full eclipse by July 1 to 15. About the first half of August the back change begins and is complete in four or five weeks.

Remarks: Adult (winter) plumage is assumed by old males very early in the autumn; by males of the year at least a month later. I have seen old males (Lake Umbagog, Maine) that were fully feathered on September 13. Most of them appear to be in perfect winter plumage by the third week of the month. Pinioned birds in confinement do not usually develop winter dress so soon as wild ones.

Young in Down: Compared to the young of the Mallard, the Carolina is at hatching time very much darker, almost black above, while the dark area is much more extensive. The yellowish dorsal patches so characteristic of many surface-feeding ducks are almost absent in the present species. They are represented by very obscure light spots on the wing-rudiments and on the sides of the rump. The face pattern is similar to that seen in more typical ducks and is somewhat variable. A narrow blackish line runs back from the eye to the occiput and sometimes bifurcates. Above this is a wide light-colored superciliary stripe. There is usually a faint indication of a dark patch over the region of the ears. The general color of the lower parts is buffy white to very light sulphur-yellow. The yellow tints are more pronounced on the sides of the face and neck.

DISTRIBUTION

Confined to the United States more closely than any other species of duck, this beautiful bird has suffered so much because of this fact that it was at one time well on the way toward extinction. The Federal Law giving it protection at all times came none too soon. Less than half a century ago it was still abundant in most parts of the United States east of the Great Plains, and this fact must be borne in mind when estimating the values of the various records. The species is not strictly resident, though it breeds in most of the localities where found. East of the Mississippi and north of the Carolinas it is chiefly migratory.

Breeding Range

Cuba

The Wood Duck is a not rare resident in Cuba (Gundlach, 1875), and Dr. Thomas Barbour tells me that at present it is still common on the island. It breeds commonly also throughout Florida on the coasts as well as in the interior (Scott, 1888; F. M. Chapman, 1888; B. H. Warren, 1890; Cory, 1896). According to the U.S. Biological Survey notes it breeds along the entire Gulf Coast to Texas; in other words, in Alabama and Mississippi. In Alabama it is reported as breeding in small numbers in Autaugua and Montgomery Counties as well as on the Alabama River (Golsan and Holt, 1914). It nests to some extent in Georgia also. In South Carolina it still nests in some numbers locally (Wayne, 1910). In North Carolina, where Coues (1871) stated that it bred abundantly near Fort Macon, the species appears still to nest in some numbers, as at Ellis Lake and near Buxton (Philip, 1910). T. G. Pearson, C. S. and H. H. Brimley (1919) state that many still nest in North Carolina. (See also U.S. Biological Survey records.)

Eastern United States

It nests also in Tennessee wherever suitable localities may be found in a State so poor for ducks (Houser, Bull. Amer. Game Prot. Assoc., 1919, p. 15). It is now spoken of as increasing (U.S. Biological Survey records). Pindar (1889) and Garman (1894) both reported it common in summer in Kentucky, but at present this is probably no longer true.

The Carolina Duck used to be rather common in Illinois (Nelson, 1876) and still breeds in certain appropriate districts (Cory, 1909). According to Kumlien and Hollister (1903) it was in the first years of the present century still fairly common as a breeder in the central and northern parts of Wisconsin and in the south at Delavan Lake. In Indiana, however, it became a rarity some time ago.

MAP 72. Distribution of Carolina Duck (*Lampronessa sponsa*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

Evermann (1888) mentioned it as very rare in Carroll County, but A. W. Butler (1898) speaks of it as resident in some numbers in Indiana as a whole, and it still breeds near Konts (Woodruff, 1907). The records for Michigan are monotonously like those for other States. Gibbs (1879) speaks of it as a very common breeder. Cook (1893) refers to it as rapidly diminishing as a nesting bird. In recent years Barrows (1912) can only say that a few are still found breeding in Michigan; and the same situation obtains in Ohio. Stating that it used to be common and that the species is now rare, W. L. Dawson (1903) and Gossard and Harry (1912) are not absolutely certain that any breed there now.

H. B. Bailey (1912) asserts that even nowadays the Carolina Duck is not a rare breeder in Virginia, where he met with them nesting in the mountainous areas. It is known to be still breeding also, though rarely, in western Maryland (G. Eifrig, 1904) and regularly in Delaware (Rhoads and Pennock, 1905). According to W. Stone (1909) it is now a rare summer bird in New Jersey; Harlow (1918) reports that it is still to be found breeding in Burlington, Cape May, and Cumberland Counties. It is widely distributed and breeds in various localities in Pennsylvania (B. H. Warren, 1890), at present particularly in Lancaster, Bedford, and Pike Counties (Harlow, 1918). In New York, where the species used to be very abundant, it is said to be still fairly common in favored localities, such as the Seneca River and the Ontario sections (Eaton, 1910). The same applies to New England, where the species still breeds in many localities, though on the whole it is an uncommon bird.

Canada

In eastern Canada the Carolina Duck is everywhere exceedingly rare. Only very few were breeding in Nova Scotia even thirty years ago (Downs, 1888), and the same was true of New Brunswick even longer ago (Chamberlain, 1882). According to the U.S. Biological Survey notes it still breeds in New Brunswick at Chatham, St. John, and Woodstock. On Prince Edward Island it is a very rare breeder (MacSwain, 1908). As far as I know it has never yet been met with on Cape Breton Island, Newfoundland, the Magdalens, or Anticosti, though a specimen has been recorded from the Gaspé Peninsula (C. W. Townsend, 1920a). Stearns (1890) was told by the natives that the species is not rare and that it breeds in the interior of Labrador, but no good record was established until C. W. Townsend (1913) reported a male taken at Long Point, near Mingan, southern Labrador, on July 1, 1912. This was most likely a straggler.

In Quebec this species is not common (Dionne, 1906), but at Montreal, though only a few breed, a number spend the summer (Wintle, 1896). The Macouns (1909) state that it nests in the Ottawa region and that it is still a common migrant and breeder at Ottawa (C. W. G. Eifrig, 1910) and in southern Ontario, where it is common on Georgian Bay, in the Parry Sound and Muskoka districts, and probably also in northwestern Ontario. Presumably the bird straggles over the entire area between the Great Lakes and James Bay, for specimens have been taken at Moose Factory and even Trout Lake (A. Murray, 1859), but it must be very rare throughout this entire region and most likely does not breed. In Manitoba the species is common in the east, and about Lake Winnipeg (J. and J. M. Macoun, 1909) extending west to Carberry and Lake Winnipegosis, and north to Cumberland House (E. E. Thompson, 1891). Though it is rare on Lake Winnipeg (E. E. Thompson, 1891), Seton (1908) definitely shows that it at present occurs regularly, though rarely, west to Souris River, Brandon, Shoal Lake, and Lake Winnipegosis. West of these localities the species has been practically unknown and regarded as absent throughout Saskatchewan and Alberta to western British Columbia; but Mr. Wm. Rowan writes me that about Edmonton he believes it was at one time more common than is generally supposed. In this connection the remarks of Preble (1908) are of great interest and significance. He regards the species as a rare summer resident (breeding?) north to the Peace River valley and refers to a specimen taken at Fort Chipewyan, Lake Athabasca, as well as to the testimony given him as to its occasional occurrence on the lower part of Peace River. Personally, I have no doubt of its presence in Saskatchewan and Alberta, though unquestionably it is exceedingly rare between Manitoba and the Rockies. R. MacFarlane (1908) records a nest, two eggs, and a female taken at Fort Providence, May 15, 1885, and another specimen taken at Moose Lake, June, 1890. He also records a nest and an egg from Cumberland House taken June, 1890, and asserts that he has never met with this species at Fort Chipewyan, Fort Good Hope, etc.

In British Columbia and Vancouver the Carolina Duck is not common (Kermode, 1904), though it used to breed commonly on the lower Fraser at Sumas, Chilliwack, and Burnaby Lake (Fannin, 1891), and at Agassiz (J. and J. M. Macoun, 1909). A. Brooks (1917) reports that it is still a regular breeding bird on the lower Fraser. Cantwell (Recreation, vol. 8, 1898) records a mounted specimen at Juneau, Alaska, shot there about 1896. Some of the old western records undoubtedly refer to the Hooded Merganser, so they must be accepted with caution.

Western United States

In the United States west of the Mississippi, as in western Canada, the Carolina Duck is as good as absent from a large belt between about 100° and 115° west longitude. On the Pacific coast it used to be common in Washington, but it is now rare as a breeder about Puget Sound (Edson, 1908; Rathbun, 1915; U.S. Biological Survey records), though according to W. L. Dawson and Bowles (1909), it is still common on the lower Columbia. It was recently noted near Tacoma (J. H. Bowles, The Murrelet, Sept., 1922). In Oregon it was formerly a common resident in Washington County (Anthony, 1886) and at Fort Klamath (J. C. Merrill, 1888) and even twenty years ago some were nesting locally (Pope, 1895–96; Woodcock, 1902). Half a century ago it used to be plentiful in California though now it is rare, occurring chiefly in the San Joaquin and Sacramento Valleys, but breeding south at least to Ventura County and east to Lake Tahoe (Grinnell, Bryant, and Storer, 1918; J. Dixon, 1924). In Nevada it was very rare even a generation ago (Hoffman, 1881), and we may well doubt whether it now occurs at all. I have been unable to find any record of its occurrence either in Arizona or in New Mexico, and it is not known ever to have nested in Colorado, though it occurs there rarely, and probably breeds (W. L. Sclater, 1912). J. A. Allen (1872) found it quite common in autumn on Great Salt Lake, Utah, and it is still (1919) said to be a rare breeder there (U.S. Biological Survey notes). In Idaho it was said to be common in the north at Fort Sherman (J. C. Merrill, 1897), though according to Rust (1915) it is becoming rare in Kootenay County. As might be expected it is very rare in Wyoming, though it possibly breeds there (W. C. Knight, 1902; Grave and Walker, 1913). In Montana it has bred at Flathead Lake and possibly in one or two other localities (A. A. Saunders, 1921). There is no evidence that it breeds in the Glacier Park region, and most of the records for Montana, Idaho, and Nevada are unsatisfactory.

In the next belt of States going eastward, the Carolina Duck is more common than in the mountain region. It is probably not so very uncommon in North Dakota even now, at least in the eastern parts, and it is said to have once bred at Grafton, Walsh County (U.S. Biological Survey records). McChesney (1879) found it very rare on the Coteau des Prairies, South Dakota, but in this State it was recorded as common in the southeast part (Agersborg, 1885). A recent writer (Visher, 1913) says only a few now breed in Sanborn County. It was an abundant breeding bird in Minnesota as late as the date of Hatch's book (1892), and is probably even now not uncommon there. In fact, Roberts (1919) states that it is on the increase especially in northern Minnesota. In Iowa it is still found as a breeding bird (R. M. Anderson, 1907), as also in eastern Nebraska (Bruner, Wolcott, and Swenk, 1905). So also it was common in Kansas in summer (Snow, 1875; Goss, 1891) and it bred there at least as late as 1909 (Harris, 1919). Missouri and Arkansas form one of the chief summer refuges for this duck. Widmann (1907) says it is still fairly common in Missouri, and Howell (1910) speaks of it as a very common breeder in southeastern Missouri at the present time. In the Oklahoma "Oklahoman" (September 25, 1921) Mr. Watt, the State Game Warden, announces that several pairs had again nested in that State, and in Arkansas it is still common in the swamps of the east, where it breeds (Howell, 1911). It was plentiful and still nests in some numbers in Louisiana (McIlhenny, 1897; Beyer, Allison, and Kopman, 1907), as I myself can testify.

It is resident in Texas, excepting possibly the extreme northwest and the extreme southeast. According to the U.S. Biological Survey notes, it is still common in the east and is found south to Houston and San Antonio. Strecker (1912) speaks of it as a rare breeder and resident throughout the State. Dresser (1866) found it fairly common and resident at San Antonio, where within another generation it had become rare (Attwater, 1892). A few still breed about Kerrville (Lacey, 1911), and appar-

ently it was formerly common even in the northwestern part where McCauley (1877) met with it in numbers about the head-waters of the Red River.

Mexico

It may be that this species breeds even in Mexico. Villada (1891–92), who states that it is found in the Valle from October to March, says that specimens are sometimes taken on the Laguna de Texcoco in August. Dr. E. W. Nelson, however, who travelled and collected much in various parts of Mexico, never saw it there and the well-known collector, Mr. W. W. Brown, did not find it in the Valle when making a collection for the Museum of Comparative Zoölogy a few years ago.

Winter Range

Eastern United States

With the exception of the Pacific Coast the Carolina Duck does not winter regularly in any region north of the 40th parallel, south of which its cold-weather habitat is essentially the same as its breeding area. It will not be necessary, therefore, to go into great detail. In New England it occurs in winter accidentally in Massachusetts and Connecticut (G. M. Allen, 1909) and is said by G. H. Perkins and Howe (1901) to be a permanent and not uncommon resident species in Vermont, in spite of which statement it must be regarded as extremely rare there in winter. It is occasionally found as late as the middle of December in New York State (Eaton, 1910), and possibly winters there at times. The northern extremity of its real winter range in this section is, however, New Jersey, where it is of regular, though rare occurrence (W. Stone, 1909). The same is true of Pennsylvania (B. H. Warren, 1890) and Maryland (Kirkwood, 1895). In Virginia many stay if the winter is mild (H. H. Bailey, 1913), and essentially the same statement applies to the Carolinas (T. G. Pearson, C. S. and H. H. Brimley, 1919; Wayne, 1910). Thence south it is a common winter bird, especially in southern Georgia (Harper, MS.) and in Florida (Scott, 1888; F. M. Chapman, 1888; Cory, 1896). The species is resident in Cuba (Gundlach, 1875) and is said by Scott (1891) to be regular but rare on Jamaica. All other authorities regard it as very rare or accidental in Jamaica (March, 1864; Bangs and Kennard, 1920). There is one record of its occurrence in the Bermudas, December 16, 1846 (J. M. Jones, 1859). It has never, to my knowledge, been met with in the Bahamas or in any other of the Antilles.

In the interior, east of the Mississippi, it winters from the Gulf States north, being resident, for instance, in Kentucky (Pindar, 1889; Garman, 1894). Its northern winter limit in this region appears to be southern Ohio, southern Indiana, and southern Illinois (Cooke, 1906), but sometimes specimens are found in midwinter as far north as Ann Arbor, Michigan (Covert, 1876).

Western United States

Between the Mississippi and the Rocky Mountains, where the species is almost everywhere rare on the Great Plains, the northern boundary of its winter range is wholly undetermined. Some of the Colorado records are probably winter occurrences and on the whole it may be presumed that where the bird is found at all it is not north of 40° north latitude. Cooke (1906) speaks of it as wintering as far north as Kansas, but it does not appear to be common in the cold season even in Arkansas, whence it has been reported from Alma, Fayetteville, and Stuttgart (Howell, 1911). According to the older writers (McIlhenny, 1897; *et al.*), it is a common resident in Louisiana, and Beyer, Allison, and Kopman (1907) wrongly assert that it is rare in winter in the southern part of that State, for I have myself seen it there in great numbers. It is resident all over Texas (Strecker, 1912) and has been reported in winter from the Rio Llano, western Texas (W. Lloyd, 1887), as well as from San Antonio (Dresser, 1866).

On the Pacific Coast the Carolina Duck winters much farther north. Odd birds remain through the cold weather in southern British Columbia (Brooks, *fide* J. and J. M. Macoun, 1909), and it is an occasional resident in the Puget Sound district of Washington (Edson, 1908). Anthony (1886) states that it is a common resident in Washington County, Oregon, and the same seems to have been true of the Fort Klamath section (J. C. Merrill, 1888). According to a more recent writer, Pope (1895–96), it is a common resident in Oregon. Its present winter status in California is not very certain. Ap-

parently it winters throughout the southern and western part of the State, for it has been taken as far south as San Diego County in the last days of November (J. Grinnell, 1915; Willett, 1919a; Grey, 1918). I have not found records of its occurrence in Arizona or New Mexico.

The specimen taken by Colonel Abert at Mazatlan (G. N. Lawrence, 1874) was probably a winter bird, and it is certainly strange that the species has not been met with in northern Mexico. Sanchez (1877–78), Herrera (1888), and Villada (1891–92) all state that it occurs in the Valle de Mexico, the last-named giving October to March as the duration of its stay, but Mexican records need to be verified. A very remarkable record is that given by de Armas (1893) for Colon, Panama! The species is also included in J. J. Rodríguez's (1909–10) List of Guatemalan Birds!

Mexico

Panama

Guatemala

Migration

The Carolina Duck is not a very early spring migrant, arriving in the northern United States during the latter part of March and early April. The dates of arrival given by Cooke (1906) are: Massachusetts, March 24; New York, March 25; Ohio, April 1; and eastern Canada, Montreal, April 24; Ottawa, April 22; southern Ontario, April 17. West of the Mississippi the dates given are: Iowa, March 20; Minnesota, April 4–6; southern Manitoba, April 15. My earliest Massachusetts record is March 21, at Ipswich.

Cooke very aptly remarks that the autumn migration is nothing more than a withdrawal from the northern part of the summer range. The dates when the species was last seen are chiefly in October, and are as follows: Ottawa, October 27; Montreal, November 1; Maine, October 27; west of the Mississippi last seen in Iowa, November 9. In especially favorable spots a few remain until late in the autumn. I have seen considerable flocks in eastern Connecticut in mid- or late November.

Out of a few hand-reared Carolinas which I from time to time banded and released at Wenham, there were some returns from points farther south, one from Georgia. Heinroth's birds, bred and ringed in Berlin, went usually southwest, once as far as 620 kilometers (Heinroth, 1912), but one was curiously enough taken in Kurland, 850 kilometers northeast of its starting point in late winter (Heinroth, 1915) in company with a ringed Mandarin Duck.

European Records

It remains to say a few words about the numerous occurrences of the Carolina Duck in Europe. The species is a very common one in zoölogical gardens where it is often kept in a practically free state and hence frequently escapes. Consequently it has been taken many times in the British Isles and also in France, Germany, and Austria. Of greater interest is its repeated appearance in Austria where, up to 1886, it had occurred three times in Styria alone (von Mojsisovics, 1886). In December, 1883, there was a flock near Gratz and in the winter of 1890–91 another flock appeared in Slavonia, upper and lower Austria, and Styria. Mojsisovics von Mojsvár (1897) gives no less than half a dozen records between 1883 and 1891 and points out that not only did none of the specimens show signs of captivity but that it was impossible to learn of any gardens that missed some of their birds. Fatio (1904) says the species occurs repeatedly in Switzerland, and in view of all this testimony it seems to me probable that some of the earlier escaped birds have bred in central Europe and are now at large there in the basin of the upper Danube.

GENERAL HABITS

The Carolina Duck is an inhabitant of deciduous forests and small inland waterways. In New England it prefers large, slow-moving brooks and small rivers and the inlets of ponds. As one travels up to the spruce- and pine-clad uplands of central Maine and New Brunswick, it is seen much more rarely, so that everywhere in the

"North Woods," so called, it was probably always uncommon. Audubon's vivid account of this duck has never been approached in interest by any of the later writers, and from it one gains an excellent idea of the habitat in Louisiana and Kentucky. Farther south they love the old cypress swamps. I have seen them in large numbers in such a swamp near the head of the Santee River in South Carolina. But they are by no means always found in the vicinity of woods, and often feed on shallow sloughs in open meadows near but not with other ducks.

In spite of the superficial similarity between this duck and the Mandarin of China, the females being almost alike, there is probably no close relationship. Repeated efforts to hybridize the two have always resulted in failure. I think it is perhaps worth while to enumerate a few important differences in the skeletons which may not have been noticed before. In the Mandarin the bill is shorter and the nasal orifice higher and more rounded; the forehead also is a good deal narrower. The whole profile of the forehead is more convex, a character which does not show at all in the flesh, because the feather crest of the Carolina makes its forehead look much rounder than it really is. Probably the most important skull difference, however, is in the lachrymal bone which in the Mandarin is inflated and broader and approximates much closer to the squamosal process, forming a more nearly complete orbital ring. Comparing the sternums it will be found that the posterior lateral process is shorter in the Mandarin and the included opening smaller. The tracheal bulbs are by no means alike for the Mandarin's is nearly circular in outline but compressed dorsoventrally while the Carolina's is elongated more or less transversely (elliptical). Another rather striking difference is in the length of the legs for the smaller-bodied Mandarin actually has the longer leg, his femur, tibiotarsus and tarsus taken together exceeding the Carolina's by about fifteen millimeters.

Wariness. Carolina Ducks are pathetically tame and are easily approached by the embryo sportsman either on foot or by canoe. Very often in paddling downstream a pair or small company will flutter ahead around one or two bends and settle down again, repeating the manœuvre several times and allowing the canoeist to come within twenty-five or thirty yards each time. William Brewster (1924) thought their hearing acute, but their sight inferior. This is true, at least in the daytime. I have seen what appeared to be an old female return to a spot where a flock of young birds had been shot at and either killed or separated, showing almost no fear from her recent experience and calling lustily. In spite of their lack of wariness they are not easy to shoot over decoys, on account of their independent behavior toward other ducks.

On the nesting grounds Carolina Ducks often seem rather shy, or at least retiring by nature, and are apt to roost in retired or shady places. Although the female usually leaves the nest when the tree is approached without caution, there are instances of a

perfectly wild bird allowing herself to be stroked while she was sitting (J. Dixon, 1924).

Daily Movements. They are active in the evening, and I was once able to time the accuracy of their evening flight by watching a flock of some twenty birds that came regularly to my enclosed duck pond at Wenham in August, 1913. I found that this flock did not vary in the time of its arrival more than fifteen minutes. They arrived in small groups between 6:25 and 6:40 and remained all night unless disturbed. I have also found flocks feeding and calling to one another very actively late on moonlight nights in October, while captive birds may be heard calling at all hours of darkness but especially, of course, on warm spring nights. Audubon speaks of shooting many on their regular flights in the course of an hour of twilight.

Heinroth (1911), in his remarkable essay on the psychology of the Carolina Duck, has made so many new and interesting observations upon the free-flying specimens living under quite natural conditions in the Berlin Zoölogical Gardens that I shall extract from him very freely. His work and that of Audubon comprised until recently about all we knew of the intimate habits of this species. Like most ducks, says Heinroth, the Carolina Duck is most vivacious in the morning and evening hours. At this time it flies about, searches for nourishment, and makes the acquaintance of other members of its species. The relatively large eyes enable the bird to fly well through the trees of a wood, even when darkness is quite deep. Yet the Mandarin Duck is even more nocturnal. In the later hours of the forenoon Carolina Ducks usually rest like other water-fowl, standing on one leg, with bill hidden under the feathers of the shoulder, either on the shore or on branches or stumps in the water. Later on, during the noon hours they regularly bathe, as all geese, ducks, and swans do, and the bath is preceded by the well-known "playing chase," during which are practiced all the tricks of eluding the enemy. This flying, diving, and splashing becomes contagious and soon all members of the pond are participating. Even very young ones may take part in this play. The bath over, the birds swim to shore, shake themselves, and beat their wings against their sides; then after removing the water they go through the well-known oiling process. This period is followed by one of less activity, and the afternoon is spent in "puddling" around the shores. As twilight begins to come on, first single couples and then whole flocks rise and fly to other waters. Many fly over the fences in order to search for worms on the lawns of the gardens. These habits are varied greatly according to the season and the weather, and on thick foggy or rainy mornings the flight period is delayed.

Swimming, Gait, Perching. Carolina Ducks sit lightly upon the water, with the long tail held higher than in most other ducks making an excellent field-mark. The elevation at which the tail is carried is probably conditioned by the degree of excite-

ment in each individual, for when the bird is alarmed or about to fly the tail is carried particularly high. The young and half-grown birds escape readily by diving as do also the old when wounded or cornered. Ordinarily the Carolina Duck does not dive, except during the play before bathing, yet they are well able to dive and Heinroth has seen his Berlin Garden birds diving and picking up acorns from the bottom of a pond. Like most other surface-feeding ducks they probably dive more commonly while still immature. The young are capable, when pursued, of swimming under water at least ten feet shortly after they are hatched (Dixon, 1924).

The gait of this species on land is nimble, and is accompanied by a pigeon-like nodding of the head, but the head movement is lower and is not carried out at each step. The head is brought forward rapidly, remains stationary for a moment and in the meantime the body advances a bit beneath it. Heinroth suggests that the pause in the head movement may be made in order that the bird may see more clearly. In their walking attitude they are more erect than in the case of the Mallard or other true ducks, and they perch well on trees, preferring rather large limbs, though it is possible for them to keep their balance even on very small branches. Dixon has shown that females can fly up to a nest-tree and assume an almost upright "flicker-like" position, clinging to the bark with their claws and bracing themselves by depressing the stiff tail against the trunk. One of his photographs shows a wild bird in this position. Indeed, some observers have mistaken Carolinas in such a position for one of the larger woodpeckers.

I am unable to decide just how much of its time this duck spends perching in trees, but am inclined to think that except in the nesting season they roost on stumps, dead limbs, and partly submerged logs rather than in tall woods.

Flight. On the wing these ducks are swift, though silent. The wing-beat is rapid and nearly noiseless, and as seen against the sky the Carolina has a Widgeon-like appearance with its short chunky neck, while the long tail is very characteristic. They rise from the water with a considerable upward spring, though without the powerful splash or the altitude attained by the Mallard or Black Duck. They show remarkable ability in flying through thick woods, even when it is almost dark, and they often shoot down from a considerable height on to a very small pool. If they are used to coming to a certain pool they will dive into it without preliminary circling, and do not show the embarrassment which other ducks exhibit under similar circumstances. As a rule they do not fly at any great height when flushed, and consequently they are lost to sight much sooner than other water-fowl, for they are apt to dip behind or through the nearest clump of trees. Heinroth says he never saw a Carolina Duck struck down by the European Peregrine, although he has frequently seen these falcons pursue the species. Nevertheless they are not reckoned as very fast fliers, comparatively speaking.

It seems to be a characteristic of both the Carolina and the Mandarin that a flock on the wing keeps in no special formation; there is little "close order," groups continually forming, separating, and reforming, with one or two individuals lagging far behind.

William Brewster (1924) mentions an "odd habit of stopping abruptly in mid-air to twitch their necks and shake their wings convulsively a few times before continuing on their way." I have never noticed this, but Mr. Brewster's words bring up the picture of similar curious "fluttering" pauses often seen in Widgeon.

Audubon mentions the species as flying in flocks of thirty to fifty or more in Louisiana and Kentucky, and in eastern Massachusetts at various times in early autumn I have seen as many as thirty gathered together. But ordinarily, of course, Carolina Ducks are now seen as single birds, pairs, or trios, at least in the New England States. I doubt if it was ever a species that travelled in very large companies.

In especially favorable places where good protection is offered it is still possible to see a really great assemblage of birds gathered together in a very small area of some secluded swamp or woodland pond. But when these companies are disturbed, they break up into the typical migrating (family?) flocks of a dozen or so.

Association with other Species. According to my own observation Carolina Ducks seldom associate intimately with other *Anatidæ*. I have many times watched single birds that came to the shore in front of a "gunning stand" where numerous tame Mallard decoys were kept. The solitary Carolina Duck would always walk out upon the beach to rest or preen its feathers at some distance from the decoy ducks. In breeding these birds in captivity, I was never really successful until I had removed all other species from the pond. Under artificial conditions they live in close and friendly contact with Mandarins.

Audubon noted that during the winter they allow ducks of different species to associate with them, but this is certainly not characteristic.

Voice. The voice of this species is so peculiar that it requires detailed description. The two sexes have entirely different notes. I extract freely from Heinroth's writings as he made so complete a study. In the male the voice is a high chirping *ji* or a soft *jiib*, with the accent on the second, prolonged syllable; this sound is not audible at any great distance. When accompanying the female in the search for a nest, the male utters a soft and frequently repeated *jib-jib, jib, jib*. The note of the male is modified in various ways, and when uttering louder tones he raises his crest at each individual sound. Heinroth likens the chirping and whispering of several males heard in the dark to the sound of a company of rats. The female has a variety of calls. American writers usually express it by the syllables *hoe-eek* or *oe-eek*, and it is often wrongly attributed to the male. This is the note most commonly heard, and it

is uttered as a warning call. Heinroth describes the note the female utters during flight when calling to companions on the pond below as very peculiar and resembling the syllable *huák*. There are also other modifications of the *hoe-eek* call. Another quite distinct note is heard during autumn and winter, a certain *kruí* or *kerrí*, which is thought to express a coquettish mood. A very different note is heard from the female when nest-hunting in spring, — a soft and very continuous *tĕ-tĕ-tĕ-tĕ*, and by this murmuring note one can determine the beginning of the season of sexual activity. Heinroth says it is also used in what he calls the "engagement game," in order to arouse the male. Those who have been fortunate enough to observe the female calling or coaxing the young to drop down from the nest-hole have described the sound as like *kuck*, *kuck*, *kuck*, *kuck*, *kuck*, rapidly repeated from five to twelve times. While watching feeding wild male birds in the autumn at very close ranges, I have heard a very low squeaking *jeeb* with an occasional drum-like quality to it, kept up for a long time. This was certainly not audible at more than eight or ten yards.

The downy young *peep* like the ducklings of other species, but not so loudly as young Mallards; in the Carolina Duck the note is usually uttered twice in succession. Even after the young are on the wing there may still be doubt as to their sex, judging from the voice alone, for the *hoe-eek* of the female is still so fine and acute as to be easily confounded with the *jiib* of the adult male. The notes of the Mandarin are similar in character but have a different tone.

The trachea of the male (figured by Eyton in 1838) is not very different from that of many other species. The bony box at the bifurcation is left-sided, very thin-walled, and nearly two centimeters in its longest diameter (see under general account).

Food. The Carolina Duck is an omnivorous species, feeding chiefly, according to Audubon, on beechnuts, acorns, and berries of various sorts, besides insects, snails, tadpoles, and small water-newts. In the Carolinas he found them feeding in the rice-fields as soon as the grain became milky. Howell (1911), speaking of Arkansas, lists the seeds and leaves of aquatic plants (such as the water-lily, pond-weed, and wild rice), acorns, beechnuts, chestnuts, wild fruits, and insects. McAtee (1911) in an analysis of seventy-five stomachs found wild rice 11.62, wild celery 3.17, pond-weed 6.72, or a total of 21.51% for these three foods alone. McAtee (1915) mentions swamp-privet as a very important food, on the testimony of numerous hunters. The birds are said to consume the seeds, leaving little for other species of ducks when they arrive. In California the species has been found feeding in corn- and wheat-fields after harvest, and consuming also wild grapes and acorns, this latter appearing to be a very general article in the diet of western birds (Grinnell, Bryant, and Storer, 1918; J. Dixon, 1924). The elongated fruits of the valley oak sometimes reach a length of $2\frac{1}{4}$ inches, but they are not too big for a hungry Caro-

lina Duck. Nearly all writers, however, including the eastern observers, mention acorns as an important article of the food (Bailey, MS.; Kumlien and Hollister, 1903; Barrows, 1912; B. H. Warren, 1890; etc.). Beyer, Allison, and Kopman (1907) state that the seeds of the water chinquapin (*Nelumbium luteum*) are important as food and are responsible to some extent for the present abundance of the species in parts of Louisiana. Nuttall (1834) saw a stomach full of small coleoptera called *Donatius* which, being very wary, he was surprised that the Carolina Duck could capture. In Florida (U.S. Biological Survey notes) residents say they eat cypress "balls" or "cones" and Government collectors found these in their stomachs. Other Florida food comprised "paint root" (*Gyrotheca tinctoria*) and the seeds of various rushes. The stomach of one taken in eastern Massachusetts in September was crammed with the pea-sized seeds of the water-arum (*Peltandra undulata*).

These ducks do not so often tip up in feeding as the Mallard-like species and secure most of their food on or near the surface simply by immersing the head and neck.

Courtship and Nesting. The actual courtship of the Carolina Duck has, of course, been very often seen and described from captive or semi-wild specimens, but not often from the wild. Audubon mentions the bowing movements of the drake's head and the raising of the crest, and his chivalric conduct toward his mate. Heinroth (1911), however, gives by far the most satisfactory account based upon his full-winged Berlin Garden stock. In contrast to the common fresh-water or true ducks, the Carolina Duck, he says, has not the highly developed social play which takes place in the autumn or winter. In place of it there is what he terms an "elaborate chivalry." This may take place at any time of the year, and especially in the evening. The females excite the males by a certain position and by uttering their calls. The males then swim as closely as possible together, erect their crests, and chirp or whisper in various pitches, trying to crowd one another away from the vicinity of the female. Occasionally there are battles, but these do not occur except when superfluous males are present. These conflicts are never serious, although the combatants may be shrouded in a cloud of spray. They apparently never use their bills, though the skin of these birds is exceedingly tender. "Hounding," by which is meant the mated females' biting and scolding of other males to incite their own to fight, is seldom seen in the Carolina Duck. Courting males have been noted both by Heinroth and by Finn (1904) picking up food in their bills and offering it in the most gallant fashion to the female, a trait which has never before been noticed in any member of the *Anatidæ*. In the actual mating the female may lie perfectly motionless on the water for many minutes, while the male, close behind her, carries out the well-known dipping motion, bringing his head rapidly upward again. Considerable time is spent in the preparations for mating but the mating act is not followed by any postlude. The male merely swims away somewhat toward the side with head highly raised.

During the first warm days of spring Carolina Ducks begin a very careful search for a nesting site. Just what part the male takes in choosing from among the many cavities that are explored it is difficult to say, but in confinement both sexes enter freely into any kind of hollow stumps, underground burrows, or boxes which may be provided. Dixon's observations on wild birds in California made him believe that drakes led in the search for a suitable cavity, at least at first, but the final choice was always made by the duck. He rightly suggests that the prospecting of all sorts of cavities at this season of the year is a natural part of the courtship and certainly the male is just as busy for a time as is the female. Many writers have mentioned the preference that these ducks show for the nesting hollows of the Ivory-billed or Pileated Woodpeckers, or partly rotted-out Flicker holes, but they also choose any sort of natural cavity in decayed trees and even at times enter chimneys of camps and deserted buildings. It is possible that numerous females have come to grief in this manner, for I have heard of a number of instances, and have seen one myself. Heinroth's free-flying Carolina Ducks often entered chimneys and burned themselves, so that he finally had to wire up these attractive but too dangerous apertures! I have never had the opportunity of seeing wild breeding females enter the nest-hole, but Audubon mentions their ability to dive directly into the hole without first alighting, which scarcely seems possible. Others have seen them alight on a perpendicular tree near the hole. It is necessary for them to be able to accomplish this feat, since they sometimes occupy old deserted woodpecker holes in large bare tree-trunks. In Massachusetts they resort more commonly, I think, to partly hollowed red maple, oak, and other trees where a large branch has at some time been torn away — the sort of cavity occupied by the gray squirrel. I have been shown a nest in a large oak tree standing in the middle of a corn-field at least a quarter of a mile from the Ipswich River, and much greater distances from water have been recorded. No doubt the nest is more commonly close to some stream or swamp, often in fact directly over water, and from ten to thirty feet above the surface. At times, however, it is considerably higher. Kingsford (1917) mentions a hole fifty to sixty feet high in which he found Carolina Ducks nesting.

There appear to be no recorded instances of this species having ever nested on the ground, though Audubon found one nest with ten eggs in the fissure of a rock on the Kentucky River. There are at least two records of nests having been found in the haylofts of barns (H. R. Taylor, quoted by Grinnell, Bryant, and Storer, 1918; Sage, Bishop, and Bliss, 1913). In Cuba Gundlach (1875) states that they choose hollow palms or other trees, especially fallen ones, as well as crevices of rocks or similar holes. Several observers have noted with astonishment the small size of the aperture through which the female Carolina Duck can make her way, and in California even the hole of the Red-shafted Flicker has been selected (Sampson, 1901). Heinroth (1911) found after considerable experiment that a hole with diameter of only

eleven centimeters suited his Carolina Ducks best. In Audubon's account, holes over deep swamps, above cane-brakes, or on broken branches of high sycamores, seldom more than forty to fifty feet from the water, are mentioned as the most usual sites.

Among the Carolina Ducks studied by Mr. Dixon in California, the narrowest opening chosen measured just three and one eighth inches, but it was eight inches high. In one case when the opening was both small and irregular, he found that the female had actually cracked the shell of an egg still in the oviduct! The cracks were "sealed over" by the time the egg was laid and the egg itself proved to be fertile. I must say that I should have had difficulty in believing the explanation offered for these cracked eggs, had not Major Allan Brooks told me of exactly similar instances with Buffle-head Duck eggs in British Columbia.

There are one or two rather doubtful records of Carolina Ducks and Hooded Mergansers nesting in the same cavity (Boardman, 1903; R. M. Anderson, 1907).

No doubt individual pairs breed in the same tree year after year, when unmolested. We do not, of course, know whether the male is always the same. All I can say is that in my established breeding stock, I scored disastrous results when, for the sake of improving fertility, I one winter substituted a lot of strange males.

The nest-cavity is often several feet in depth and the nest itself is composed of rotted débris of wood, dry leaves, sometimes feathers of birds of other species, and down from the breast of the female, but material such as sticks and leaves is not brought to the hole. Audubon noted that when the nest was placed in the broken branch of a tree it could easily be observed from the ground on account of the feathers and other material about it. It is said that the feathers of domestic fowl have at times been utilized.

According to my own observations, confined Carolina Ducks begin laying in Massachusetts from April 24 to May 5, depending on the variations of the season. Wild birds in the same locality nest somewhat later but the species is always an early breeder, from early March in its southern haunts to late May or early June in the northern. In Cuba, where of course it is undoubtedly entirely resident, Dr. Thomas Barbour found them nesting as early as February. Cooke (1906) mentions young found in northern Florida, March 19, 1877 (!). Audubon found them pairing about the first of March in Louisiana and Kentucky, sometimes a fortnight earlier, and in Arkansas newly hatched young have been collected on April 4. Beyer, Allison, and Kopman (1907) give early April as the beginning of the nesting season in Louisiana. In Missouri young were found in the second week in May (Widmann, 1907). Farther north, in Minnesota and Michigan, eggs are laid from the end of April till the beginning of May (Hatch, 1892; Barrows, 1912). At Cumberland House, Saskatchewan, a nest and one egg were taken in June, but the northernmost record for the species is one of a nest and two eggs taken at Fort Providence, Great

Slave Lake region, May 15, 1885 (R. MacFarlane, 1908). At Ottawa they begin to nest May 1st, and young have been found in June (J. and J. M. Macoun, 1909). In Pennsylvania they nest in April or early May; in New England, April 23 to May 2, though there are a number of much later dates, probably from females whose first clutch had been disturbed. From late March through the whole of April is the usual time in California, but late May dates are as elsewhere common.

The average number of eggs in a clutch is probably eleven plus; clutches vary from nine to fourteen, but seldom number less than ten or more than thirteen. Unusually large clutches have been frequently found: nineteen in a nest (Barrows, 1912); in another twenty-one (Sampson, 1901), etc. Most of these large clutches are undoubtedly the work of two females, and Sampson, who examined his twenty-one eggs very carefully, found nine of them to be somewhat darker and larger than the rest. All late clutches are, I think, almost certain to be due to the destruction of the first nest and not to an actual second brood as claimed by some observers, because the female remains with the brood until they are well grown. The eggs themselves vary in color from nearly white to a dirty yellowish buff or "old ivory" and are rather globular in shape. The average dimensions are 2.05 by 1.58 inches (52 by 40 mm.), but eggs much larger and much smaller have been found (J. Dixon, 1924). The period of incubation is longer than that of other surface-feeding ducks, Mallard, Black Duck, etc., and varies from thirty to thirty-two days. Heinroth, who puts the incubation period of the Mallard at twenty-six days, considers the Carolina Duck as taking at least five days longer, which seems to me correct. From observations on confined as well as wild birds, it is found that the down is not usually added to the nest until the clutch is nearly complete. It is gradually formed and becomes dense during the first of the sitting. The down itself is white, as is the case with all species which commonly nest in trees. Eggs are usually deposited in the morning, which seems to be the case with most ducks, but Mr. Dixon (1924) records a case where one of his wild females laid regularly in the late afternoon or evening. According to Heinroth the day on which the female lays the last egg may be taken as the first day of sitting, and at this time the first eggs have reached a degree of incubation equivalent to thirty-six hours of sitting. This discrepancy is completely corrected because of the fact that the older eggs require a somewhat longer period for development. But in the wild, Dixon found that incubation often began before the set was complete. One of the birds he had under observation laid twelve eggs, but she began to sit on the day the ninth one was deposited. Actual hatching was a slow process, even taking as long as forty-eight hours in one case, which is not surprising, for even with captive-laid eggs a set where all the eggs are started at one time will take at least twenty-four hours to hatch out.

While the females are sitting it is the general opinion that the males leave the vicinity of the nest and collect in little groups. I have many times seen groups of

three or four males on Massachusetts streams in the latter part of May. Audubon says that the males do not join the females again until the young are able to fly, and according to what I have seen and read this is true. The broods of young in our eastern States are certainly very seldom guarded or attended by the male, yet there are evidently exceptions to this general rule, for Mr. Dixon has noted the proximity of the male in California throughout the whole period of incubation and his presence the very day the ducklings were hatched.

There are so many interesting observations made upon the free-flying Berlin Carolina Ducks that I must mention some of them in connection with the laying and sitting period, for American writers since Audubon have with few exceptions made no detailed observations. These Zoölogical Garden birds laid their eggs at the rate of one a day and ordinarily completed the clutch in eleven days. When the first clutch was taken away, the second eggs were not smaller, but the third laying was slightly reduced in size. The eggs were laid in the morning hours and while laying the last eggs the duck remained on the nest a longer time. The male accompanied his mate to the nest but did not always sit close at hand waiting for her to come out. Some males left the females as soon as the latter arrived at the nest and the habit of accompanying the female stopped entirely when incubation began. A female which was under very close observation from a concealed post left the nest regularly at half-past eleven in the morning. A quarter of an hour before this she became restless and began to stuff the down beneath her from the edge of the nest. She frequently sat down and got up again. After the down had been carefully arranged over the eggs the bird came to the entrance of the box and immediately flew away. During all manipulations of the nest the bird was very careful with the eggs and seemed never to place her feet directly upon the eggs, but rather on the sides or edges of the nest.

The daily absence from incubation of Heinroth's females was from one-half hour to an hour. When the duck was disturbed she never covered the eggs and was then usually absent for some time, combining her enforced absence with her usual rest. During this period the eggs remained completely exposed, but came to no harm, and only the restlessness which overcame the bird shortly before the daily recess led to the instinctive covering of the clutch. Dixon's females (wild) in California left the nest regularly in the morning and the evening and were absent an hour or so. There is a great variation in the reaction of different individuals to outside disturbance. Some become very sensitive, while others will tolerate handling. I remember one of my own Carolina Ducks sitting in a box in a brooding condition that had to be forcibly ejected, although she had no eggs under her. A most interesting type of behavior in the brooding female was noticed by Dixon and shows a very different response to different sorts of outside disturbances. For instance, when any person approached the nest tree, talking or whistling as he went, the female simply left the

nest and flew directly away. But if, especially at night, the observer crept up quietly and then scratched the trunk in imitation of a climbing beast, the duck dropped into the water close by and went through the familiar broken-wing tactics, endeavoring to entice the supposed enemy away.

Heinroth found that in spite of the great heat which is generated in some of the nesting hollows, no harm ever came to the female or to the eggs. Linden (1882) noted that the young Carolina Ducks were kept in the nest for twenty-four hours after hatching, and Heinroth's observations, as well as Dixon's, bear out this statement. Heinroth saw the mother draw considerable oil from the tail gland and rub it on her underside soon after the young were hatched. She repeated this action at frequent intervals while in the box with the young, but she was never seen to do this while incubating. This appears to be Nature's method of automatically waterproofing the young. A point of great interest with this duck is the high percentage of infertile eggs, nearly always the case in captive stocks. I always supposed this to be a result of unnatural conditions, but Dixon's studies on wild birds showed nearly fifty per cent which did not hatch. Now this is just about the proportion of sterility found in captive birds. It is rare to have over seventy per cent fertile in one season, and this is very much higher than the average proportion. It would seem that this unusual amount of sterility is characteristic of the species.

So many loose statements and so much hearsay evidence concerning the methods by which the young are transported to the ground or water have been allowed to accumulate in the literature, that it is impossible as well as futile to consider them all. The first careful set of observations on this much-disputed point are, again, those of Heinroth. About quarter of seven in the morning of the day after the hatching the mother duck began to look out of the nest-opening and shortly afterward flew away directly to the ground and not in her usual direction. The note which she uttered was the well-known (but somewhat modified) *tetetetet*. "Immediately after one of the ducklings appeared in the entrance, and a moment later I heard it drop on the roof in front of me, and then two more followed, then a few more, and in the lapse of about three quarters of a minute the nest was empty." There is an excellent photograph accompanying Heinroth's paper, showing two of the young about to jump from the nest-hole. Actually the little ones stood in the entrance for a moment and then took a powerful up and out jump, shooting from the box as if thrown by some invisible power. They all landed safely either on the roof or on the ground, and the old one immediately set out for the pond with those she had collected, paying no attention to three who were left behind owing to various mishaps. At other times Heinroth observed the evacuation of the nest by the young and sometimes several minutes elapsed between the time the mother left the nest and the young jumped. Among the most remarkable adaptations are the needle-like claws with which the young are provided and which enable them to climb up perpendicular or even over-

hanging boards, in woodpecker fashion. They are thus quite able to climb out of any nesting hollow however deep; but this climbing propensity is lost within a few days. Rogeron (1903) made the interesting observation that while young Carolina Ducks frequently climb to the ceiling of their pen, they never attempt to climb down again, but simply allow themselves to drop to the ground. Numerous writers have noticed that the young spread their wings or their tails to break the force of the fall, but both Heinroth and Rogeron have shown that even if this does occur it is quite superfluous as a protection. The long fluffy down and the exceedingly small weight (only about 16–24 grams) enable them to drop from any elevation on to any surface without injury.

More recently Dixon (1924) was present during the evacuation of three different nests and in each case the young left the nest entirely under their own locomotive power. It is usual for the female to entice the young to the nest-opening, but in one of his cases all the young came out of their own accord while the female was off on her morning vacation! We can therefore say definitely that the usual method of leaving the nest is without the aid of the parent bird and in response to a stimulus so strong that the nest is actually empty in some cases in less than a minute.

Now as to whether the female herself does *ever* transport the young: that is a question on which a great deal has and might still be written. I do not propose to discuss it at length because I think we lack carefully checked and recorded observations. If one reads the accounts of females carrying young in the bill, on the back, or between the feet, one is left a little cold, for in most of the stories the alleged occurrences happened a good many years ago or were perhaps reported at second or third hand. Alexander Wilson was apparently the first to write about it. Audubon, too, evidently believed that the mother carried the young in her bill when the nest was some distance from the water, but he says that on several occasions when the nest was thirty or forty yards from the water he himself actually observed the young falling out of the nest. Thirteen of Forbush's (1912) many Massachusetts correspondents thought that the female transported the young in her bill, and one saw the female push the young out. Forbush has collected many cases of transportations since then and believes that some of them at least are true. He has very kindly shown me many of his letters on the subject and I have read them most carefully, still not entirely convinced. Of the many published records I am not going to speak, for they would take much space. Most of the older writers, indeed, believed that the mother carried the young either in her bill, between her feet, or on her back. In this connection I might add that recent observations on Eiders nesting on high cliffs show that the young are perfectly capable of tumbling from almost incredible heights without the slightest injury. We know, too, that young ducks can and do travel very long distances over land when led by the parent.

Heinroth (1911) and Beebe (1914) have both described the growth of the young

and the assumption of the immature plumage. The plumaceous tail-feathers, which are 29 mm. long, do not begin to grow until ten days after hatching. Then an increase takes place, due to the pushing out of the new rectrices carrying the natal down on their tips. The down is not lost until the feathers are about 75 mm. long; that is, until about a month after birth. At this time the young bird has a remarkably long and stiff tail. At about fourteen days, feather growth begins on the under tail-coverts and pectoral areas. At the age of seven or eight weeks only a small trace of the downy plumage is visible, in the region of the nape. The flight feathers scarcely begin to grow until the age of four weeks, and the bird is capable of flight near the ninth week. Then follows a period when there is little change in plumage, but when three months old the transition to mature plumage begins, with the exception of the flight feathers and greater coverts, which of course are not moulted until the following spring.

Not much has been written on the care of the young in the wild state. As before remarked, the little ones dive expertly when frightened and as in the case of other young ducks it is very difficult to detect them once they have scattered.

Status. Older writers, notably Audubon, testify to the extreme abundance of this species in all the eastern part of the United States. He speaks of shooting thirty to fifty on an evening flight and mentions a person in the South who trapped several hundreds in the course of a week; while in the markets of South Carolina they brought only thirty to forty cents the pair. Information as to the former abundance and present diminution of the Carolina Duck is so voluminous and writers are so generally in agreement as to its present and past status that only a few of the more important investigations need to be noted here. In general this species was exceedingly abundant all over the eastern United States until the early eighties. About the year 1888 it was still what I should call an abundant breeder in the valley of the Ipswich River, Massachusetts, and females and flocks of partly grown birds were a common sight. In the whole valley to-day it is doubtful whether more than five to eight pairs are breeding. My experience is typical of that of most of Forbush's (1912) numerous correspondents all over Massachusetts. At the close of 1908, thirteen of them reported it as increasing as against one hundred and four who recorded a decrease. The great general decrease began in the seventies, and now, in 1924, after ten years' protection, it is probable that the small five per cent remnant is holding its own. But there are many factors that are constantly working against any natural increase in the northeastern States. Suitable nesting areas are being reduced in size and the all-the-year close time as decreed by Federal Law is not always effective, where at the beginning of the shooting season thousands of ignorant shooters take the field. Even among educated sportsmen mistakes are common, and the scattering remnant continue to fall a prey to the all too eager hunter. Without doubt the

very scarcity of the species is now, in itself, a factor toward its inability to gain in numbers. There are certain areas in eastern Maine, such as Crawford Lake, Machias River, where Carolina Ducks are still common birds. Some of the areas of that State which have been flooded by recent lumber operations hold goodly numbers. Possibly they are increasing a little there. William Brewster (1924) found that in the Umbagog region of Maine they held out well until about 1900, long after the Hooded Merganser had all but gone as a breeding bird.

Fortunately there are still vast areas in the Carolinas, Georgia, Florida, and the Gulf States, where this duck is resident and fairly common. This I know from my own experience, as well as from the testimony of local authorities, and so long as large timbered swamps remain, the species will continue to exist locally in considerable numbers. M. L. Alexander (1918) estimated that in the winter of 1913–14 eight hundred and fifty Carolina Ducks were marketed in New Orleans. In 1915–16 four hundred and ninety-two were marketed, and since then, because of the Federal Law, none have been sold. That part of the species which constituted the northern migrants has been more reduced than the southern stock. In Cuba, I am told by Dr. T. Barbour, the drainage of swamp areas is proceeding at such a rate as to endanger the species there.

This duck is still common in the heavy swamps of eastern Arkansas (Howell, 1911), and Widmann (1907) states that in September flocks of seventy-five to a hundred may still be seen on the peninsula of the Missouri. Cory (1909) speaks of it as still a common summer resident in parts of Illinois and Wisconsin, but decreasing in numbers. Barrows (1912) gives a very discouraging outlook for Michigan, but in Minnesota the diminution apparently did not set in until after the early nineties (Hatch, 1892). In western New York, where spring shooting was prohibited as early as 1902, the species was said by Eaton (1910) to be holding its own in spite of the tremendous slaughter in the autumn. It was almost exterminated in Pennsylvania and New Jersey, where probably only a very few breed in select localities (Harlow, 1918). The Macouns (1909) considered it a common summer resident in the lake region of Ontario and think it may be abundant in northwestern Ontario.

In western Canada the Carolina Duck is reported as still locally abundant in British Columbia on the lower Fraser wherever suitable breeding conditions exist. It is bound to disappear from the eastern areas where the timber is being cut away and the woodland ponds are drying up (A. Brooks, 1918). W. L. Dawson and Bowles (1909) considered it still fairly common on the lower Columbia River. Grinnell, Bryant, and Storer (1918) in their recent exhaustive account of California game-birds, consider the Carolina Duck, though formerly common, now "nearly extinct" in that State. Since then it has shown a decided tendency to increase (Dixon, 1924; and others).

It is very evident to any one who comes in contact with sportsmen and sports-

men's periodicals that there has been a great and gratifying response of the species to the protection afforded by the Federal Migratory Bird Law, which went into effect in 1915. Particularly is this true of Mississippi, northeastern Kansas, and Tennessee (Bull. Amer. Game Protective Assoc., etc.). In the New England States there has been some increase, but the more populated areas show either a very slow gain or none at all.

If real protection could be afforded to this duck in the northern States until October 1, some would migrate before they were killed, for killed many will always be in spite of there being a "close" time upon them. But as recently as 1910, resident hunters in Arkansas were shooting young Carolina Ducks by the latter half of June, so that present conditions are a great improvement.

Harper (U.S. Biological Survey notes) a few years ago estimated about two thousand in the eastern half of Florida, north of Okeechobee, but I think this is too low. He places the number in the great Okefinokee Swamp of Georgia and Florida as only five hundred, which is certainly conservative.

Any estimate of the annual increase in Carolinas must take into account the high sterility of the eggs, both in captive and wild birds, and it is quite possible that this peculiarity may in part account for the rapid disappearance of the species as a whole.

Enemies. I know of no special investigation as to the natural enemies of the Carolina Duck. Heinroth noted that they are well able to escape the European Peregrine Falcon. Boardman (1903) considered the introduction of the pickerel into the Calais region of Maine as a factor in the diminution of all breeding ducks in that vicinity. However, as this duck breeds over an enormous territory inhabited by pickerel, pike, and large-mouthed bass, this can hardly be of general significance. Audubon mentions the mink, skunk, and raccoon as their enemies, but the snake which enters the nest and destroys the eggs he considered the most important destructive agent on the land. In certain parts of California, Dixon (1924) found the raccoon the most dangerous nest robber, and it seems that the ducks in those places actually found safer cavities near farm-houses than they did back away from roads and dwellings. On the water the young have to guard against the snapping turtle, the garfish, and the eel, while farther south the alligator is a menace.

Naumann (1896–1905) mentions the two species of intestinal worms, *Echinorhynchus polymorphus* and *Distomum deliculatum*, as enemies of the Carolina Duck in captivity.

Food Value. I can testify to the delicious quality of the Carolina Duck's flesh at all ages and know of no writer in any part of the country who has found it other than excellent. The birds are almost always exceedingly fat, especially in the autumn. In the days of Audubon and Wilson they were common in all the markets of the

eastern cities, where they brought from thirty or forty cents to nearly double that price the pair. Wilson considered their flesh inferior to that of the Blue-winged Teal. In Frank Forester's (Henry W. Herbert's) "Sporting Scenes and Characters" it is related how the imaginary character, Harry Archer, that model sportsman, reared Carolina Ducks for the table and fed them on celery in order to improve the flavor! Frank Forester himself had a very high opinion of the flesh and considered it second only to the Canvas-back's.

HUNT. When the species still existed in large numbers they were shot in the evening and morning during their flights, and even in thickly settled Massachusetts one of Forbush's (1912) correspondents remembered sixty being killed during a single morning. They were shot, of course, at all seasons of the year, many even before they could fly. Farther south many were taken in nets or traps and brought to the market alive (Audubon). Carolina Ducks were always easily killed from canoes paddled carefully down quiet waterways but were not shot over decoys as commonly as other species. Their tameness when approached quietly over the water very likely has some relation to their nocturnal habits and comparatively poor daylight sight. They certainly have no defect of hearing.

CAPTIVITY. The Carolina Duck is probably better adapted to aviaries and parks than any other ornamental water-fowl. It meets the many requirements of the fancier to a remarkable degree. Its plumage is striking, while the voice is agreeable and not too loud. At the same time the species may without difficulty be kept in large numbers on small pools even during the breeding season. Besides this, they are extremely hardy and do not even suffer during the severe winters of northern Germany, if open water is provided. They become extremely tame, and if allowed to develop their wings they remain quite local in their habits and are loath to leave the immediate vicinity of their birth-place. Above all, they lay freely and the young are more easily handled than those of any of the smaller ducks.

This duck was imported alive into England at a very early date, but just how early I have been unable to determine. Edwards (1743–51), who described a specimen shot in England before 1747, at the seat of William Nicholas, Esq., supposed that it had strayed from some neighboring estate, and mentions seeing several live birds that had been brought from Carolina to London. On the Continent they were well known at least as early as the 17th century. The zoölogical collection of the Condés at Chantilly received six specimens in 1663, and others were kept by Louis XIV at Versailles. In Holland it was kept so commonly in the 17th and 18th centuries that it was even used by the nobility as a table bird (Loisel, 1912). Sonnini, in his edition of Buffon, writes that he kept Carolina Ducks in France, and also noticed the eclipse plumage of the male. In various parts of America Alexander Wilson had seen many

tamed individuals. He mentions a Mr. Nicols, who had a yard "swarming" with Summer Ducks near Havre-de-Grace, Maryland, forty years before his own time. Audubon, too, bred in captivity birds which were caught near his home. From this evidence it is clear that the species was exported alive to Europe and probably kept in captivity in this country as early at least as the 17th century.

The keeping and breeding of Carolina Ducks is a fascinating subject and a volume might be written on it. I reared them for seven years, sometimes over a hundred in a season, and at various times I allowed a few to grow their wings. Such birds always stayed in the pond until their pinioned relatives were caught up and housed in late November, after which they usually migrated, although at times they delayed their departure as long as possible, for they have visited us at Wenham as late as December 30 (1913).

Much might be written about the type of pond suitable for keeping these splendid ducks, the different styles of nest-boxes, the hatching and the rearing of the young, and the winter care of the flock, but these points can only be touched upon. The following references are worth consulting: Heinroth, 1911; Finn, 1904; Job, 1915; Phillips, 1915; Rogeron, 1903.

The flock which I began to accumulate in 1909 increased in productivity for several years until it reached its height in 1914 and 1915. I then, in an endeavor to improve the fertility of the eggs, which at times were nearly 50% sterile, obtained a number of wild males from Louisiana and sold off some of the old males. The next spring, 1917, in spite of the fact that the same old females were present (although a few selected young females were added each summer to balance deaths and accidents to the old stock) there was a reduction of about 50% in the number of eggs laid. This is interesting as showing that disturbance to the old mated pairs had a very disastrous effect.

With fifteen to eighteen pairs I was able to rear to maturity at best about one hundred young from a maximum of 150 to 170 eggs; and this despite the fact that they had the pond to themselves. I regard this result as much better than the average.

Starting from the time when the birds are placed in the pond, their management is briefly as follows: On this first day (which should not be too early in the spring) the ducks very likely will walk the wire in an attempt to find an opening. If not contented they will climb the wire, and I found it best to place a T-shaped wire strip all along the top of the fence about two feet wide and projecting inside as well as out. This prevents the birds from climbing out and ground vermin from getting in. The laying season at Wenham began from April 24 to May 5 and stopped June 6 to June 16, once extending to June 25. Captive males as well as females are very active in searching out hollows, and several females often lay in one nest. From this it follows that the better practice, after laying has been going on for a week or ten

days, is to take from each nest every day all except one egg, for in the competition among different females eggs are often pushed out of the boxes and broken. In confinement the males are more or less polygamous, the females probably monogamous.

Eggs are usually set under hens, selection of a smallish mother being important, and about twelve or thirteen eggs are given to each mother. One year I allowed a Mallard to hatch thirteen Carolina Ducks in a pen built across a small brook and in this case every duckling that hatched was reared to maturity. This is quite a different experience from that of Heinroth, who did not believe that the female Mallard would respond to the call or appearance of young Carolina Ducks.

Mandarins and Carolina Ducks get along together very well and in my opinion never hybridize. This point is of such interest that I must go into it a little more fully. Suchetet (1889) cites several instances from the year 1850 on, and claims to have seen one. Klein (1891) writes of the rearing of such a hybrid in the Copenhagen Zoölogical Gardens. Since that time, notwithstanding the fact that the two species have been almost always kept together, no actual hybrid has been described, although Finn (1904) mentions a doubtful one which did not reach maturity. Heinroth (1911) made special efforts through a German breeder to secure fertile eggs between the two species and always failed, and I have never heard of such a hybrid being raised in this country. This physiological antagonism and the various rather different traits, all point to a not very close relationship, in spite of the great similarity of the females.

In my pond I usually kept a slight excess of female birds, but this was offset by the regular visits of several wild males during the laying period. Wild females never came to the pond at this time.

Nest-boxes can be of almost any style, but better than the artificial homes I found the huge, partly hollowed, and irregular trunks and roots of several old willow trees. These hollows, connected with the ground by little "duck ladders" and arranged with suitable floors of soft punk or sod, served admirably and were almost always the favorite nesting sites. Boxes about a foot square, and with holes four or five inches in diameter, set up on posts five feet above the ground or water were nearly as good. In these the nest of hollowed sod or other material may be only two or three inches below the opening, or it may be at the bottom of a box two or three feet deep. It makes very little difference. Neither does the position of the nest-box in the pond seem to matter a great deal, although I always liked to have as great a variety as possible, some high, some low, some hidden in dense willow sprouts, and some in exposed situations. I also provided a number of burrows made from six-inch tile pipe which led from near the edge of the water back into a nest-box sunk into the ground with only its hinged lid showing on the surface. At times these were eagerly patronized but at other times almost neglected. In different years my flock seemed

to have different preferences, and I never could tell which would turn out to be the favored nests.

As to size of opening, Heinroth considered eleven centimeters to be almost right for the opening of the box, while he provided a depth of thirty to forty centimeters and an inside diameter of at least twenty-one centimeters, using natural hollow logs mostly. The narrowest opening used by wild birds seems to be about $3\frac{1}{8}$ inches and in such narrow passages females have been known to crack the egg while still in the oviduct (J. Dixon, 1924). Perhaps a safe size would be about $4\frac{1}{2}$ by $4\frac{1}{2}$ inches (115 mm.).

One of the greatest troubles with Carolinas is the high percentage of infertile eggs which are common to all hand-reared flocks. The same thing has even been recorded in the wild (J. Dixon, 1924). Mr. Wormald once told me that 68% was the very highest proportion of good eggs he ever got in any one year. Mr. Blaauw found that 50% was about as good as his flock would do, and I think in the long run mine averaged very little better. The proportion of sterile eggs varies a great deal from year to year.

Some fanciers have a deal of trouble in getting the newly hatched young to feed, in other words, to "get them started growing." At one time Mr. H. K. Job had whole broods that seemed all right when placed in the rearing coop but died without even a chance. But the artificial rearing and handling of the young is a large subject and one which has not really a proper place in a "natural" history, so that here I shall have to leave it.

In the London Gardens the average duration of life of eighty-five individuals was only about three years, which seems to me very low indeed. Their oldest individual lived nearly ten years (P. C. Mitchell, 1911).

The food supplied to adult birds is usually the ordinary grains supplemented by some green food from time to time and in the spring a little fish or meat. Instances are on record of meat-hungry Carolinas confined in an aviary actually killing and devouring small cage-birds such as canaries (U.S. Biological Survey records)!

The price of good stock is now about double what it used to be, $20.00 to $25.00 the pair, and even at that good birds are hard to obtain. I was told in Holland that they are no longer reared there in anything like the numbers of former years. Yet I feel sure that once a good strain is brought together, the fancier will come much nearer to meeting expenses with this than he will with almost any other sort of duck. I know that for several years my birds a good deal more than paid for themselves.

HYBRIDS. I do not know that there are any instances of the taking of wild hybrids between this and any other species. But in captivity this duck has often been crossed with the Mallard, producing sterile progeny. Crosses with the European Widgeon, Common Pochard, and Rosy-billed Duck also produced sterile hybrids (Heinroth, 1911; Poll, 1911). Grey informed me that he obtained young from the mating

of a male Brazilian Teal with a female Carolina. Other hybrids recorded are as follows: with the Chilean Pintail (Proc. Zool. Soc. London, 1891, p. 330), with the common White-eyed Duck, *Nyroca nyroca* (the latter some time ago at Kew Gardens, London), and the Bahama Duck (Journ. f. Ornithologie, 1915, p. 302). Mr. Wormald told me that a hybrid which he raised with the Yellow-billed Duck (*Anas undulata*) hatched in twenty-seven days, which is at least three days earlier than a Carolina's egg ought to hatch.

MANDARIN DUCK

AIX GALERICULATA (LINNÉ)[1]

(Plate 50)

SYNONYMY

Anas galericulata Linné, Systema Naturæ, ed. 10, vol. 1, p. 128, 1758.
Aix galericulata Boie, Oken's Isis, 1828, p. 329.
Cosmonessa galericulata Kaup, Oken's Isis, 1829 (*fide* Gould).
Lampronessa galericulata Wagler, Oken's Isis, 1832, p. 282.
Dendronessa galericulata Swainson, Animals in Menageries, p. 233, 1837.
Aia galericulata Eyton, Monograph Anatidæ, p. 119, 1838.
Anas asitori Temminck (*ubi?*), *fide* G. R. Gray, List Birds British Mus., vol. 3, p. 133, 1844.
Aex galericulata P. L. Sclater, List Vertebrate Animals, ed. 8, p. 438, 1889.
Aix galericulata brunnescens Clark, Proc. Biol. Soc. Washington, vol. 27, p. 87, 1914.

VERNACULAR NAMES

English: Mandarin Duck, Chinese Duck or Teal.
French: Canard Mandarin, Sarcelle de Chine.
German: Mandarinen Ente.
Swedish: Praktgas.
Chinese: Yuen-yang, Een-yeong, Lung-tow-ya, Hi-so (Purple Mandarin, also "Faithful Bird" and "Yellow Duck").
Japanese: Oshidori, Kimnodsui.
Natives on the Amur: Ngoiro, Waire.

DESCRIPTION

ADULT MALE: Forehead glossy green, changing into purple on the crown; long occipital crest coppery red, changing into dark purple and green below; sides of head buff, anteriorly changing into white around the eyes, whence the white extends on to the sides of the head and the crest; lower part of crest dark metallic green; chin and throat cinnamon; sides of neck with long pointed feathers of a chestnut color, striped with whitish along the middle; back, rump, upper tail-coverts, and lesser wing-coverts hoary brown with a dull bronzy gloss; lower neck on front and on sides glossy chestnut, bounded on the sides with five crescentic bands, three black and two white; sides, breast, abdomen and under tail-coverts white; sides and flanks pale brown, vermiculated with black, the longer feathers with white and black crescentic bands at the tip; lower flanks tinged with glossy chestnut; scapulars bronzy grayish green, glossed with blue, the outer ones white, broadly edged with velvety black on the outer web; primaries gray on the outer web, tipped with green on the inner web; secondaries glossy bluish green, tipped with a white band; inner tertial with shaft much bent downward, giving to the outer web a falcate form; the inner web excessively widened into a very broad

[1] As these pages go to press, Miller (1925) advocates *Dendronessa* as the correct generic name for this duck.

chestnut fan, edged on the upper part with whitish, and on the lower with velvety steel black, the outer web of the same feather velvety steel black; under wing-coverts brown-gray; tail brown olive-gray (Salvadori, 1895).

Iris dark brown with yellowish outer ring (von Schrenck, 1859; *et al.*). Bill reddish brown (von Schrenck, 1859); or brightest pink-red or cerise (Finn, 1915). Nail whitish or white (Taczanowski, 1893; Naumann, 1896–1905); nail bluish flesh-color (von Schrenck, 1859). Tarsus and toes reddish yellow, webs blackish (von Schrenck, 1859); feet yellow (Taczanowski, 1893), or orange (Finn, 1915). The bill becomes much brighter in the spring as do also the legs.

Wing 234 mm.; tail 117; bill 35; tarsus 33.

Weight about 1.3 pounds (0.6 kilogram).

Adult Female: Head, neck and crest gray; a band at the base of the bill, around the eyes, a band starting from the eyes toward the nape, chin, throat, lower breast, abdomen, and under tail-coverts, white; lower fore neck, breast, sides, and flanks brownish gray, each feather with a whitish oblong spot near the tip; upper parts and upper wing-coverts brown olive-gray; primaries brown, with the edge of the outer web gray; secondaries brown-olive with a green luster, broadly tipped with white; one of the outer tertials has the outer web black, glossed with bluish green; tail brown olive-gray (Salvadori, 1895).

Bill bluish gray with nail orange or reddish brown with brownish nail (Taczanowski, 1893). Tarsus and toes dull grayish yellow; webs grayish black (Gould, 1852).

Wing 230 mm.; tail 107; bill 35.

The female can be distinguished from the female Carolina Duck by the white band at the base of the bill, the absence of a distinct white area around eyes and the presence of the white postocular streak. Axillars uniform brown. Peri-ocular white area not increasing with age (Rogeron, 1903).

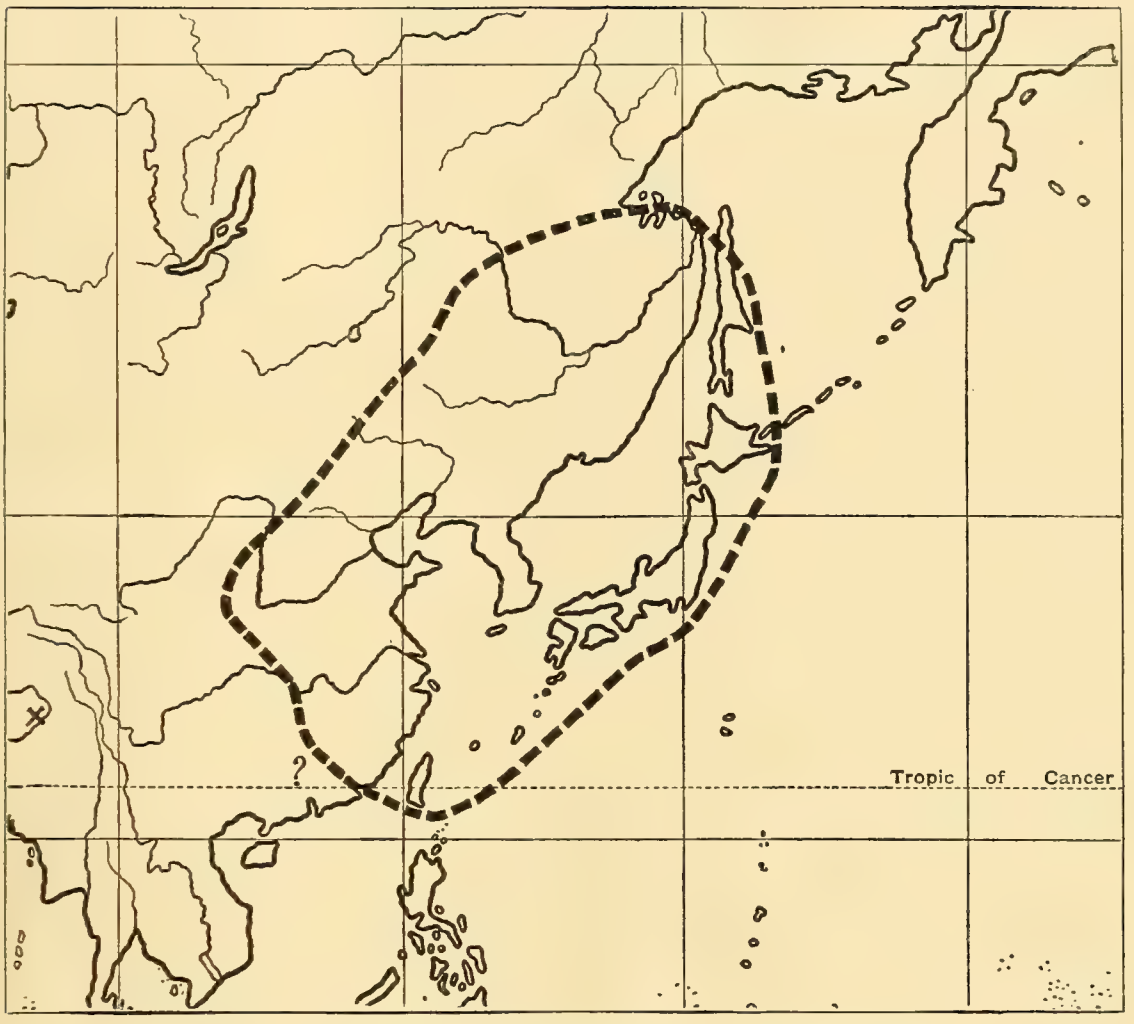
Male in Eclipse Plumage: Like female, but the brown-olive of upper parts often more glossy, and the patches in the jugular region and on sides of breast rust reddish rather than whitish. It is difficult to distinguish the sexes at this time but it appears that on the crop and sides of the breast the male in eclipse plumage always has a few scattered feathers resembling in their rich coloring the corresponding feathers of the winter plumage; in the female these feathers are never found (von Schrenck, 1859). The female always has an oblique white stripe on the outer web of the first purple feather of the speculum; this is never present in the male, though the white posterior border of the speculum is the same in both sexes (Baker, 1908). The white around the eye of the male is not quite so marked as in the female and the legs remain throughout the year of a much richer color. The bill may turn like the female's but sometimes retains the red rose tint of the full plumage (Finn, 1909). I have seen the red bill retained all summer by some of my confined specimens.

Immature Male: Resembles the male in eclipse plumage (von Schrenck, 1859).

Young in Down: There is a difference between the downy young of this species and that of the Carolina Duck. The Mandarin's young can be told at a glance because they are so much lighter in color. They are light greenish to olive-brown above, almost golden-brown on lower back. The young of the Carolina Duck are darker and more blackish above. On the lower side the young Mandarin is slightly more yellowish but there is little difference between the two species. As to the face-pattern it is the same in both.

DISTRIBUTION

The Mandarin is a strictly East Asian species, and like the Carolina Duck (*Lampronessa sponsa*), is neither entirely a resident nor entirely a migratory bird. In the south its status is usually that of a



Map 73. Distribution of Mandarin Duck (*Aix galericulata*)

resident while in the northern part of its range it occurs only in summer. The information available for these regions is too meager, however, to enable us to draw a clear line of demarcation.

The northern limit of this species seems to be the district about the mouth of the Amur. Only a few go so far north, but more are met with farther south as one follows the Amur upstream. Still it appears to be quite rare, but breeds near Mariinsk, and is the commonest duck at the junction of the Ussuri and the Amur, where it is seen in great flocks; and upstream to the junction of the Amur and the Kumar, 127° east longitude (von Schrenck, 1859). Maak (1859) first observed it as far west as the Chingan Mountains, but found it more plentiful on the Ussuri and Sungari Rivers, as well as on the Amur. North of the Amur it was found in the Bureja Mountains, and on the Udir (Radde, 1863). According to Taczanowski (1885) it breeds about the mouth of the Ussuri. It is, however, rare on the coast of the Japan Sea, especially at Strielok. **Siberia**

Farther south the species appears to be quite common on the upper Ussuri, the Suiffun and about Vladivostok (Dörries, 1888). Bolau (1881) also met with it on the Suiffun and Taczanowski (1885) has recorded it from the Sungacha. The Italian Expedition took specimens in Olga Bay (Salvadori, 1887). In Manchuria, besides the localities already mentioned, the Mandarin has been found at Yintzu (Bianchi, 1902) and seems to be quite abundant about Shin-kin (Ingram, 1909). In Korea the species seems to occur chiefly on passage, and has been so reported by Taczanowski (1888), while C. W. Campbell (1892) and Kuroda (1918) have also recorded it from the peninsula. Mr. E. H. Wilson, who has done extensive botanical work in Korea, tells me that he considers the Mandarin almost a Korean bird, and exceedingly common in spring and fall, though he did not find it breeding. According to Kuroda, however, the species breeds in Korea and has been taken in the South Keisho, Keiki and Kogen districts. Whether or not it winters commonly in Korea I am unable to say, but it has been taken in December and January (Kuroda, 1918). In general I am inclined to fix 40° north latitude as the northern boundary of its winter range. In the countries north of 40° it arrives on the Ussuri in early March and leaves in early October. The Amur region it inhabits only from late May or early June to early September. South of the fortieth parallel it is probably a resident bird. **Manchuria** **Korea**

Off the coast of the mainland the Mandarin was found on Saghalin by Nikolski, but later investigators all failed to observe it and it must at best be very rare there (Lönnberg, 1908). The only record for Saghalin is the female in the St. Petersburg Museum which was taken in the southern part (Taczanowski, 1893). It is, however, found throughout Japan, breeding but not wintering on Yezo (Blakiston and Pryer, 1878; Seebohm, 1890) and resident everywhere south of Yezo (Seebohm, 1890). Whitely (1867) recorded it from Hakodadi, and Jouy (1883) found it common in autumn on the lakes of the interior. Ogawa (1908) gives Hakodadi, Suruga, Yokohama and Nagasaki as the localities from which the species has been definitely recorded. Mr. N. Kuroda writes me that he does not consider it rare in Japan but that it visits the seaside ponds only in winter, being confined to interior waters in summer. It is also known from the island of Tsushima, between Japan and Korea (Ogawa, 1908; Kuroda, 1922), besides having been taken in the Loo-choo or Riu-kiu Islands on Tanegashima in early winter, and on Okinawashima in May (Ogawa, 1905, 1908). In Formosa the Mandarin is resident in the interior (R. Swinhoe, 1866) and has been taken in winter at Suishako and Horisha (Uchida, 1912). It is not known to have ever occurred in the Philippines. **Saghalin** **Japan**

The exact range of this species in China is not yet certain. Mr. E. H. Wilson, who has traveled so extensively in central and northern China and Manchuria, tells me that he has rarely seen the Mandarin above Hankow on the Yangtse, and that it is by no means a plentiful bird in eastern China. It evidently does not go into Mongolia, and may be confined to the eastern half of China proper. According to David and Oustalet (1877) it is found in central and southern China, but its headquarters seem to be the southeastern part. R. Swinhoe (1875) has reported it from Chi-fu, and Kleinschmidt (1913) from Kiau-chow. As regards the interior of northern China **China**

proper we have the statement of Sowerby (1912) who says it is one of the more uncommon birds in the region south of the Ordos, that is, in Shensi and Kansu. R. Swinhoe (1863a) notes that it is said to breed in Amurland, and Styan (1891) found it fairly common at Kahing, though rare at Kiu-kiang. In general it seems to be a local bird wherever found in China. La Touche (1907) found it rather rare at Kiu-kiang in the Yangtse basin in winter, and R. Swinhoe (1863a) found it at Ningpo on the coast in that season. Richthofen (1907) says it is common in autumn in the provinces of An-hwei (on the lower Yangtse), Che-kiang (on the coast) and Kiangsi (in the interior). In 1892 La Touche stated that it occurred only occasionally at Fuchow though it was said to be plentiful in the interior near Yenping-fu. In 1900 he records it as common in northwestern Fukien, especially in the Kienning region. In a still later contribution La Touche and Rickett (1905) speak of it as a common resident of Fukien.

India

How far west one might expect to meet with the Mandarin it is difficult to say. Ogilvie-Grant (1900) records a specimen from "western China" which means very little. I am inclined to fix the western limit of its occurrence at about 110° east longitude. At any rate its recent occurrence in the Burmese country is very exceptional. Baker (1908) has recorded a specimen taken from a flock of six on the Dibru River, Assam, and he is inclined to believe the testimony given by other observers as to the species having appeared on several occasions in India.

Europe

The two recorded occurrences of the Mandarin in Europe, on the basis of which the species is included in Naumann's great work, were, as the authors state, almost without doubt escaped specimens. One, an old male, was taken in the end of May, 1881, at Staburna, Lapland, and the other on January 4, 1901, near Leipzig.

GENERAL HABITS

The Mandarin is far better known in captivity than in the wild state, and comparatively little has been written about this bird, excepting by aviculturalists. Like the Carolina Duck in its habits, this is a fresh-water species, preferring rivers and lakes. Dörries (1888) in the region north of Vladivostok found it along river shores where reeds and rushes offer protection, and it followed small forest streams almost up to their sources, while von Schrenck (1859) speaks of it as the commonest duck on the streams tributary to the middle Amur. In the southerly Japanese islands it is very common on the small streams (Blakiston and Pryer, 1878). It appears, however, to be equally fond of lakes in the interior (Whitely, 1867; Jouy, 1883; David and Oustalet, 1877). Parrot (1899) speaks of its having been found by his friend Nicolaysen in the oak forests near Vladivostok, and it seems to frequent paddy-fields also (Jouy, 1883). In south-central China Richthofen (1907) found that these birds preferred clear, quiet waters at the foot of steep precipices, and that when wounded they flew into the woods and hid themselves.

Wariness. Thunberg, an early traveler, found the Mandarin extremely abundant and remarkably tame on the coasts of Japan; so much so, in fact, that the birds were not even alarmed by the noise of his gun. It is not likely that at the present time it remains anywhere unpersecuted; for as early as 1859 von Schrenck found the birds quite shy and hard to approach, even in the rather deserted regions of the lower Amur.

Daily Movements. Nothing definite is known, but on account of its large eye it is supposed to be rather nocturnal in its habits. In the morning, during the nesting season, Rogeron (1903) says that his semi-wild birds devote their time to searching for a nest. The middle of the day, from noon until four o'clock, is the period of rest, while the evening is passed hunting for insects, etc.

Flight, Gait, Diving. The Mandarin is quick and active on its feet and the flight is much like that of the Carolina Duck. The male in full plumage, so Heinroth (1911) says, is to be recognized on the wing by the large yellowish-white patch on either side of the head, but the brilliant brown fan is completely invisible, for it is pushed under the feathers of the shoulder. Like the Carolina Duck, too, it runs nimbly on land and on occasion dives and searches for food under water (Finn, 1915). The flocks when on the wing seem to crowd closely in front, and thin out into several lines in the rear, the whole causing a sound like the moaning of the wind (von Schrenck, 1859). On the water it is an exceedingly showy bird, for the male in full feather often swims with head drawn well back, chest expanded and the tertial fan-feathers strikingly erected over the back. Like the Carolina Duck, the Mandarin is thoroughly at home on trees, stumps, partly submerged logs, etc., but just how much of its time it actually spends perching on high trees it is hard to say. Von Schrenck (1859) speaks of having seen them repeatedly on trees, this, of course, in the nesting period.

Finn claims to have seen both Mandarins and Andaman Teal slide right over and off a perch upon which they had tried to alight, but these, of course, were semi-captive birds. It is not always safe to dogmatize about traits and habits in captivity, for often they are quite different, as every aviculturalist knows.

Early travelers found the present species assembled in enormous flocks in its wintering areas, and von Schrenck (1859) noted its occurrence in "smaller or larger" companies in the northernmost part of its summer range. But such assemblies probably never occur nowadays, and I have the statement of Mr. E. H. Wilson that in Korea it is usually seen in small companies of only six to ten individuals. The only definite record of its occurrence in India is that of a flock of six on the Dibru River (Assam).

Association with other Species. Presumably the Mandarin, like the Carolina Duck, on account of its rather specialized mode of life does not associate freely with other species of *Anatidæ*. Jouy (1883), however, found it in autumn on the paddy-fields of Japan in company with the European Teal (*Anas crecca*).

Voice. The voice of the Mandarin is similar to that of the Carolina Duck, but there are certain characteristic differences. In place of the *jiib* of the male Carolina

Duck, the Mandarin utters a low *uib*, the second syllable very short, and at times a subdued grunting note. Finn (1909) describes the male's note as a "snorting whistle" and the female's as a "sneezing quack." At best the notes are very difficult to reproduce.

No special alarm-note has been mentioned by any observer, though it is probably a modification of the *oe-eek* call. Rogeron (1903) remarks that his aviary birds, when alarmed, stretch their necks, compress their feathers, and flatten out the crest and wing-fans.

This species is not so noisy as the Carolina Duck. According to my own notes the *jiib* of the male is sometimes nearly a grunt, at other times rises to a fine whistle. There is also a fine chattering note, used when feeding, which is only audible at a distance of a few yards. In fact there is a great variety of calls. The *jiib* seems to come from the crop, with a deep, almost drumming sound. With many males displaying together, there is a continual chattering *jeib* or *du-ib*, the bill working very fast and the tail throbbing at each note. With the females the call is often just an *ack-ack* in single syllables, but sometimes in two syllables, more like the *oo-eek* of the Carolina Duck but not so attractive or musical.

Heinroth's (1911) observations on the note of the Mandarin are well worthy of summary. He says the note of attraction of the female is shorter than that of the Carolina Duck, sounding like *huett* or *wack*. Its coquettish note is *kett* or *ke*. The alarm-note is similar but sharper. When searching for a nest among trees he heard them utter a soft *gegegegege*, similar to that of the Carolina Duck but easily distinguishable from it. He also mentions the grunting note which I have described for the male and the soft whistling *uib* which he considered very little different from that of the Carolina Duck.

Food. So little has been recorded concerning the food of wild Mandarins that we can merely assume that their diet is similar to the Carolina Duck's. We know that the birds eat acorns greedily in captivity and will even dive for them (Heinroth, 1911; Finn, 1915b). Richthofen (1907) found nothing but acorns in the crop of one killed in southeastern China. It appears that they feed also on snails (Taczanowski, 1893) and on seeds of various kinds, grass-sprouts, worms, etc. (Naumann, 1896–1905). A most remarkable statement is that of Dörries (1888) who speaks of them as feeding in the spring on the roe of dead fish in the Ussuri region.

Courtship and Nesting. Heinroth (1911) came to the conclusion that the sexual life of the Mandarin is quite different from that of the Carolina Duck, and that in this respect it resembles the Mallard rather more than the American species. There are highly developed social plays, during which the expanded fan-shaped tertials and the finely developed head- and neck-feathers are displayed. The social play is car-

ried out only when numbers of the birds are together and need not have any real connection with actual mating.

Heinroth thus ably describes the play antics, which are so beautiful and so attractive that I must of necessity sacrifice the space here. "We then see the males with heads laid far back, the splendid crest somewhat ruffled, so that it sometimes touches the highly erected, rusty-yellow, gleaming fan-feathers, which stand parallel to each other — at the same time the beautiful primaries bordered with silvery white do not lie closely together as is usually the case in the closed wing, but rather spread out, covering the base of the tail on each side with eight silvery-white bands. In this position the birds appear peculiarly short, and to use the horseman's expression, they look 'gathered up,' moving their heads quickly, while uttering the beforementioned *uib*, the head nodding in a jerky manner, and the birds pointing their heads around suddenly over their backs, with their bills toward the inner web of one of the ruffled fan-feathers; at which time the short whistle is heard. When the males approach too near they rush at one another, a thing which rarely results in a fight. . . . When one observes such a Mandarin group from afar he might be inclined to believe that the birds were one and all of them crazy; for their continual boasting, shooting to and fro, and utterances appear to us quite useless and senseless."

The courtship in a general way is the same as with the Carolina Duck, and in captive or semi-wild birds, at least, the males show polygamous tendencies. The actual display, however, is different. Wormald describes the male in display as slowly lowering the head as though drinking, so that the tip of the bill just enters the water, when the head is jerked back quickly. The crest is raised and the chest puffed out so that the appearance is very different from that of the male Carolina Duck in display.

Probably in the wild state both sexes are entirely monogamous. So much at least would seem to be indicated by the old Chinese tradition as to their conjugal fidelity. Various of the older ornithologists have repeated stories about the Mandarin in Chinese belief and custom, and in order to verify these statements I consulted the Chinese Imperial Encyclopedia and other works. The Mandarin is, it appears, rightly regarded in China as a symbol of fidelity, but is not carried in bridal processions as has been stated more than once. The Wild Goose, symbolizing self-restraint (chastity), is used for a gift to the bride's father; never the Mandarin (Chinese Classics, Book of Li-Ki, Chapter 41). Nevertheless Mr. Kuroda writes me that in Japan it is even at the present time given as a marriage gift. In the Chinese Imperial Encyclopedia, Division of Natural History, Birds, volume 47 (published about 200 years ago) are the following references.

"The male and female sleep together [side by side] the inside wings being folded over each other."

"The male and female are never separated; if one is captured the other dies, so it is sometimes called the 'couple' bird [meaning faithful]."

"The male and female wind their necks around each other" [but there is no indication that the Chinese believed copulation took place in this manner, as stated by Koehler (1900)].

"When asleep, they wind their necks together; they are monogamous."

The following references to the Mandarin in Chinese poetry are given by Legge (Chinese Classics, 1871, volume 4, part 2, p. 418).

"The Yellow Ducks [Mandarin] are on the dam
With their left wings gathered up"

again:

"The Yellow Ducks were faithful,
How different from the king!"

So far as I am able to ascertain from the very numerous observations on confined birds, and the few notes of travelers in eastern Asia, the nesting habits of the present species are identical with those of the Carolina Duck. Dörries (1888) who collected in the region north of Vladivostok, reports the species nesting in the hollows of trees, preferably on small inland lakes or streams, occasionally, however, on some mountain stream in the thick forest areas. In captivity, confined or semi-wild males assist the females in nest-hunting, and even enter the holes, as is the case with the Carolina Duck. The clutch is complete about the end of April or early May in the northern part of the range, and consists of from nine to twelve eggs, very similar to those of the Carolina Duck but slightly paler (Naumann, 1896–1905). Mr. Hugh Wormald told me he could always tell them apart because the Mandarin's were larger. The incubation period extends to twenty-eight or thirty days, perhaps even longer (W. Evans, 1891; Job, 1915; Bennett, 1860; Wormald); certainly it is three or four days longer than in the Mallard. Those reared under hens are supposed to hatch two days sooner than when left to the mother.

The males are said to flock together while the females are sitting, frequently perching on the large branches of old trees, especially on the oaks, and presenting a very bizarre spectacle (Taczanowski, 1893). Writing of the habits of Mandarin Ducks at liberty in England, Meade-Waldo (1912) relates that the nests were in holes in trees, many of them a long way from home, and high up in almost inaccessible places. The young "got themselves down" and were extraordinarily active when first hatched. (Finn relates that a lot of downy young jumped out from a nest fifty feet high and landed safely on a hard carriage drive.) Some of the nests were at least two feet deep in a perpendicular tree-trunk, and the young found no difficulty in getting out. One brood covered a mile as the crow flies, partly through standing corn, the day they were hatched. It took them a little over an hour. The young ones showed great strength in leaping from the water and perching on branches with the mother, and one or two would jump on to the mother's back. They did not dive, apparently, although adults often do so in captivity. The old females did not

spend all their time with the broods, but were away for hours together. When returning they flew low through the trees, dodging in and out among the branches like a Woodcock, and calling loudly all the time. On hearing the mother call, the young would swim out from where she had left them, looking about to see from what direction she was coming.

Birds under observation in Regents Park, London, in the early part of the past century were hatched on the 20th of June, having been incubated for thirty-one days (Gould, 1850–54). As to the male in the Park between May 20 and the first of July he had thrown off his plumage and assumed the eclipse. The new primaries were full grown by August 3. On August 20 the change back to winter plumage began, with the appearance of two or three white feathers on each side of the breast. On the 23d the crest began to appear, and the under parts grew whiter; and a week later, on the 28th, the purple feathers on the breast began to show. By the 25th of September the two fan-shaped tertials began to develop, and on the 29th the new plumage was complete. At the beginning of October the young males as well as the old had assumed their gorgeous plumage. According to Bennett (1860) and von Schrenck (1859), the Mandarin male begins to moult into the eclipse in May, both in China and on the Amur.

There is some reason to believe that the females leave the northern breeding grounds somewhat earlier than the males, as is the case with so many of the true surface-feeding ducks. Males were found as late as October 5 in the Ussuri region (Dörries, 1888).

Status. There is no doubt that this gorgeous duck with its comparatively restricted range, has, like the Carolina Duck, suffered very greatly during the last twenty-five years. Mr. E. H. Wilson, indeed, to whom I am indebted for valuable recent information as to this species, considers it far from plentiful in east-central China, while in Japan he did not once meet with it in the wild state. Korea, he thinks, is at present the stronghold of the species. These observations are in striking contrast to those of the early travelers, who found the Mandarin in enormous numbers. Contrary to what was formerly the case, particularly in China, the birds are now not commonly kept even in the gardens of the wealthy. The introduction of cheap and effective shot-guns, and the diminution of the religious and artistic admiration for the Mandarin, may also in part explain its decreasing numbers.

Mr. Kuroda does not consider it as yet a rare bird in Japan but says that it comes down to the seaside ponds only in winter and is never common near the coast.

Food Value. The literature contains numerous references to the poor quality of Mandarins as table birds, but I can see no good reason to believe this. Dörries (1888) speaks of them as "very tasty" as a rule, although some specimens in the

springtime were unpalatable on account of their having eaten the roe of dead fish. It would be very surprising if these ducks were really below par in food value.

Behavior in Captivity. I am unable to determine whether the Mandarin was sent alive to Europe previous to 1747, but at that time Edwards drew his plate from a living specimen in the gardens of Sir Matthew Decker, Bart., at Richmond in Surrey. Since that time it has been very commonly kept in all public collections and many private parks; and it was first bred in London about seventy years ago. It is almost as well adapted as an ornament to small ponds and aviaries as its American relative, the Carolina Duck, breeding commonly, at least in Europe. P. L. Sclater (1880), however, noticed that even in the London Gardens it bred somewhat less freely than the latter and even Mr. Blaauw told me that he never had much of any luck with them and considered it a hard species to breed. For some unaccountable reason, it seems also to be difficult to rear in America, and my own experience with it has been far from encouraging for it has only bred in my pond once or twice and then laid few eggs.

The birds climb as well as Carolina Ducks, if not better, and they caused more trouble than the latter by making away over the wire fences. I was never able to keep them safely until I clipped their toes or placed a T-shaped wire on the top of the fence which surrounded the pond.

In general it may be said that Mandarins are of a more restless disposition than Carolina Ducks, not quite so tame, and somewhat more nocturnal in their habits. It is scarcely necessary to enlarge upon the breeding habits of confined specimens, for they lay in various sorts of artificial nest-boxes and mingle amicably with the Carolina Ducks in all their activities. The males enter the boxes, ordinarily according to Rogeron (1903) before the female, when the couple is on a tour of inspection. On the whole one should provide that the sexes are equally represented in numbers; but where there is a slight excess of females no lessening of fertility seems to result, for males are somewhat polygamous under these conditions. Rogeron noticed among the superfluous females that each attached herself to a particular couple. She was treated by the male as an inferior and not as a true mate! It goes without saying that a small excess of females is far preferable to an excess of males on a breeding pond.

Both Rogeron (1903) and Meade-Waldo (1912), who kept free-flying Mandarins, speak of their taking considerable flights during the breeding season and nesting at some distance from the home pond. One pair was absent a full week, but returned safely. Rogeron found that his females were fully productive when one year old, but he is inclined to think that ordinarily young males are less reliable as breeders than are the older birds, and when he lost one of his older males, for some years a lessened egg-production resulted (which, however, is not actually a proof of infertility).

During the moulting season the males neglected the females and kept together in groups.

Probably the best practice for an aviculturalist, particularly if located near waters that remain open all winter, is to allow the birds the full use of their wings. If this results in too much wandering, the females may be kept pinioned. There is no doubt that the Mandarins will lay much more freely if allowed partial liberty. Free-flying flocks were well established on the Duke of Bedford's estate at Woburn (Bedford, 1915) where they raised large broods, of which many survived. The birds, however, did poorly until given perfect freedom. On Meade-Waldo's estate they were evidently equally well established.

Larrieu (1889) gives an account of a female who nested at some distance from the pond of the estate. Beginning in March this bird came to the pond for two hours each day, regularly at 9:30 A.M. and at 6 P.M. She would then remain with her mate for a time, when the birds would both leave for the nest together. Eight or ten minutes later the male would return alone.

A peculiar trait of Mandarins is mentioned by Heinroth (1911). When a female searching for a nest finds hollows already occupied, she frequently destroys the strange clutch, a thing which Carolinas are not in the habit of doing.

Mandarins in captivity require no special food, but should have as great a variety as possible; and of course the more forage surrounding the pond the better. If the pond contains water-weeds or grass-roots it will be of great advantage, but where many ducks are kept, such a supply will soon be exhausted. Some animal food is necessary, as with all water-fowl, and Hubbard (1907) even speaks of a Mandarin drake that picked up and ate a dead field-mouse. Rogeron's Mandarins were very fond of plain acorns, and would even eat hazelnuts (*noisettes*). Finn (1915b) saw an unpinioned Mandarin Duck, raised at the London Zoölogical Gardens, feeding in a tree on green acorns.

Formerly there must have been considerable difficulty in obtaining Mandarins from the Orient, and at one of the early sales for the London Zoölogical Gardens, as much as £70 were paid for two pairs. In recent years they could usually be obtained in American markets for from $12 to $20 the pair, more cheaply during the autumn than in late winter or spring. They are, as a rule, not so plentiful as Carolina Ducks and may be a little more expensive. Most of them are birds bred by European fanciers. Hubbard (1907) gives the price in England as between £2/2 and £5/5 the pair.

Rogeron (1903) does not consider either Mandarins or Carolina Ducks as long-lived "as other ducks," but mentions one female which was at least twenty years old and had become blind. Many have lived to a good age in the London Gardens, however. In Mitchell's account (1911) of the longevity of animals in London, I note a specimen over eleven years old, but the average duration was only three and a half

years. Of course birds in a private collection seldom live to attain a great age, for accidents are all too common. I see no reason to think that Mandarins or Carolina Ducks are much shorter-lived than the more typical ducks, Mallard, Indian Spot-bill, Australians, etc. Unfortunately I kept no longevity records in my own flock but I think some must have been in my pond for at least eight or ten years.

Remarks on Proposed Geographical Races

What appears to be a doubtful, or at best poorly marked race was described by Austin H. Clark from southern Japan and eastern China (*Aix galericulata brunnescens* Clark, Proc. Biol. Soc. Washington, vol. 27, p. 87, 1914). The wing of the type specimen now in the U.S. National Museum measured according to my own notes only 236 mm. and another specimen from much farther north (Vladivostok) has just as large a wing so the character of large size cannot count for much. The plumage characters proposed for the form *brunnescens*, namely, more buffy than white appearance of the central stripe of the elongated neck feathers and the black border of the tertial fan wider than in the typical bird, do not seem to me important and certainly do not hold well in the specimens I have examined.

BROWN DUCK

ELASMONETTA CHLOROTIS (G. R. GRAY)

(Plate 51)

SYNONYMY

Anas chlorotis G. R. Gray, Voyage Erebus and Terror, Birds, p. 15, pl. 20, 1846.
Nesonetta aucklandica Hector (*nec* G. R. Gray), New Zealand Exh., p. 277, 1866.
Elasmonetta chlorotis Salvadori, Cat. Birds British Mus., vol. 27, p. 287, 1895.

VERNACULAR NAMES

English: Brown Duck.
Maori: Pateke, Tarawhatu, Tete-where.

DESCRIPTION

ADULT MALE: Head and upper neck grayish, lighter on chin and throat, and with an area of greenish reflections along the sides of the occiput. Mantle grayish brown like the neck, with indistinct wavy, black and rusty-colored barring. Outer scapulars black on the outer web, the rest nearly like the mantle. Back, rump, upper tail-coverts and tail dark brown with some greenish reflections. Sides of rump black with a whitish area anterior to it. At junction of neck- with breast-color there is an irregular white collar, not always well developed. Breast chestnut, fading into pinkish brown, and finally to gray on the lower abdomen, the whole underside being spotted with nearly round black dots. Under tail-coverts black. Outer wing-coverts brown. Speculum on the secondaries metallic green, framed posteriorly with a buffy-white bar. Primaries and tertials brown. Under wing-coverts brown, axillars white.

Iris black. Bill bluish black and with marked pectinations which are yellowish brown. Feet dull slaty gray.

Wing 195–203 mm.; bill 44; tarsus 42.

Note: Buller adds that in some male specimens the color of the lower part of the neck and breast deepens to a dark chestnut, the abdomen is mottled and banded with pale fulvous on a dark-brown ground; while in others the white neck-ring is wanting and the vermiculation on the upper parts is scarcely apparent.

ADULT FEMALE: A plain brown-colored duck with no very distinctive characteristics. Lower parts lighter brown, with nearly obsolete blackish spots. Wing as in the male. Central tail-feathers rather long and pointed.

Bill, according to Buller, grayish brown. Legs pale yellowish brown.

Wing 185–195 mm.; bill 39; tarsus 37.

IMMATURE MALE: Similar to the female, with no white collar and little or no green gloss on the head. The breast is not deep chestnut, but the round spots are more or less developed. There are a few vermiculated feathers in the mantle, and among the scapulars; the white patch at the sides of the tail just appearing.

YOUNG IN FIRST PLUMAGE: Very similar to the adult female (Salvadori, 1895).

YOUNG IN DOWN: Covered with thick soft down, blackish brown, with lighter markings on the upper surface; chin and under parts yellowish brown (Buller).

Note: Several partial-albino specimens are described by Buller (1905) in his supplement, and the head seems to be the part most affected, being often pure white.

DISTRIBUTION

THIS duck is resident in the islands of New Zealand, where it is generally distributed but has been steadily diminishing in numbers during the last half century (Potts, 1870; Buller, 1888, 1905; Hutton and Drummond, 1905). It occurs also on the Auckland Islands (Hutton, 1870) and questionably on the Chatham Islands (Hutton, 1872). The British Museum has a specimen purporting to come from there. Recently what is evidently a young male of this species was taken in North Queensland, Australia (Sassi, 1909).

GENERAL HABITS

HAUNTS. This very peculiar little duck is or was distributed all over New Zealand, being found on every inland lake and often on deep fresh-water streams, where the overhanging vegetation affords shelter. We are indebted to Sir Walter Buller (1888) for almost all that is known of the habits of this duck, and he has given a very vivid picture of its haunts. "For many miles along the low banks of the Manawatu and other tidal rivers in the North Island there are what the settlers term 'kahikatea' swamps, extending often considerable distances inland. Here the land, at all times wet and swampy, is liable to frequent inundations from the river freshets. The trees, which consist almost entirely of white pine, are laden with a prodigal growth of kiekie (*Freycinetia banksii*) which entwines itself around the trunks, throwing out tier above tier its waving bunches of flag-leaves, till a single tree sometimes supports many tons of this epiphytic growth; it also spreads along the damp ground, forming an almost impenetrable tangle, and shading from the sunlight the deep water holes left by the subsiding river. Into this secure retreat, where the sportsman and his dog alike are baffled by the very exuberance of the vegetation, the Brown Duck loves to betake itself during the day, coming out in the cool hours of the evening to feed in the creeks and lagoons."

WARINESS. In former years these ducks were ridiculously tame, and Buller (1888) says he has approached them to within a few feet. But systematic persecution has made them very wary and in his supplement Buller (1905) says it is now almost impossible to get near enough to them for a shot.

DAILY MOVEMENTS. This species is distinctly a nocturnal feeder and is seen far less than other ducks during the day. Buller (1888) says that at Horowhenua, where they were particularly abundant, one is rarely surprised during the day, except by

BROWN DUCK

Female

Male

AUCKLAND ISLAND DUCK

Male

Female

means of a dog. "But after sunset they begin to collect on the surface of the lake, emerging in pairs from their concealment, swimming down to the mouth of the bush creek, and then taking wing to their place of rendezvous. They then form into flocks, sometimes of considerable size, and are on the alert, feeding about the lake generally all night long."

Gait, Swimming, Diving, Flight. According to Buller (1888) these ducks are good swimmers and agile divers, but very indifferent fliers. He tells of approaching a flock of some sixty of them, which, instead of flying when followed, "swam towards the shore, and then forming into a line they hurried forward in a very impetuous manner, keeping close under the banks of the lake, and uttering a low confused twitter." During the evening and night they evidently congregate in considerable flocks to feed. Buller (1905) speaks of having seen a flock of 200 or more on Papaitonga Lake.

Voice. Buller (1888) speaks of a note uttered by the birds when feeding. He describes it in one place as "a peculiar and rather musical sniffing noise" and in another as "a soft and rather musical note." But he does not distinguish the notes of the sexes.

Courtship and Nesting. Neither Buller (1888) nor Potts (1870) says anything about the nesting season, which probably varies considerably. An egg in the British Museum was taken on the Rangitata River in January (E. W. Oates, 1902) and Buller (1905) mentions a brood almost full grown late in October near Rangitikei. The nest, according to him, is in places contiguous to the ordinary haunts, and always in a dry and secluded spot. It is made of dry grass and is lined with down. Potts (1870) says it is sometimes close to the edge of a swampy creek, or beneath the sheltering leaves of a large "Maori-head" (*Carex virgata*). The clutch varies in number from five to eight and the eggs are very oval and large for the size of the bird, measuring 58.4 by 43.2 mm. They are of a dark cream-color, with a slightly greasy surface (Buller, 1888). Nothing is known of the length of the incubation period nor of the relations between the sexes at that time.

Status. This species has evidently suffered great diminution in numbers since the advent of the white man. As early as 1870 Potts (1870) spoke of it as "very much scarcer of late years than we can remember it. A few years ago we used to hear tales of almost incredible bags of this excellent game bird; a few more years of inconsiderate slaughter will make the teal a rarity." By 1905 it had become very rare in the south (Hutton and Drummond, 1905) and Buller (1905) quotes a correspondent at Rangitikei as saying that in that region the species had practically

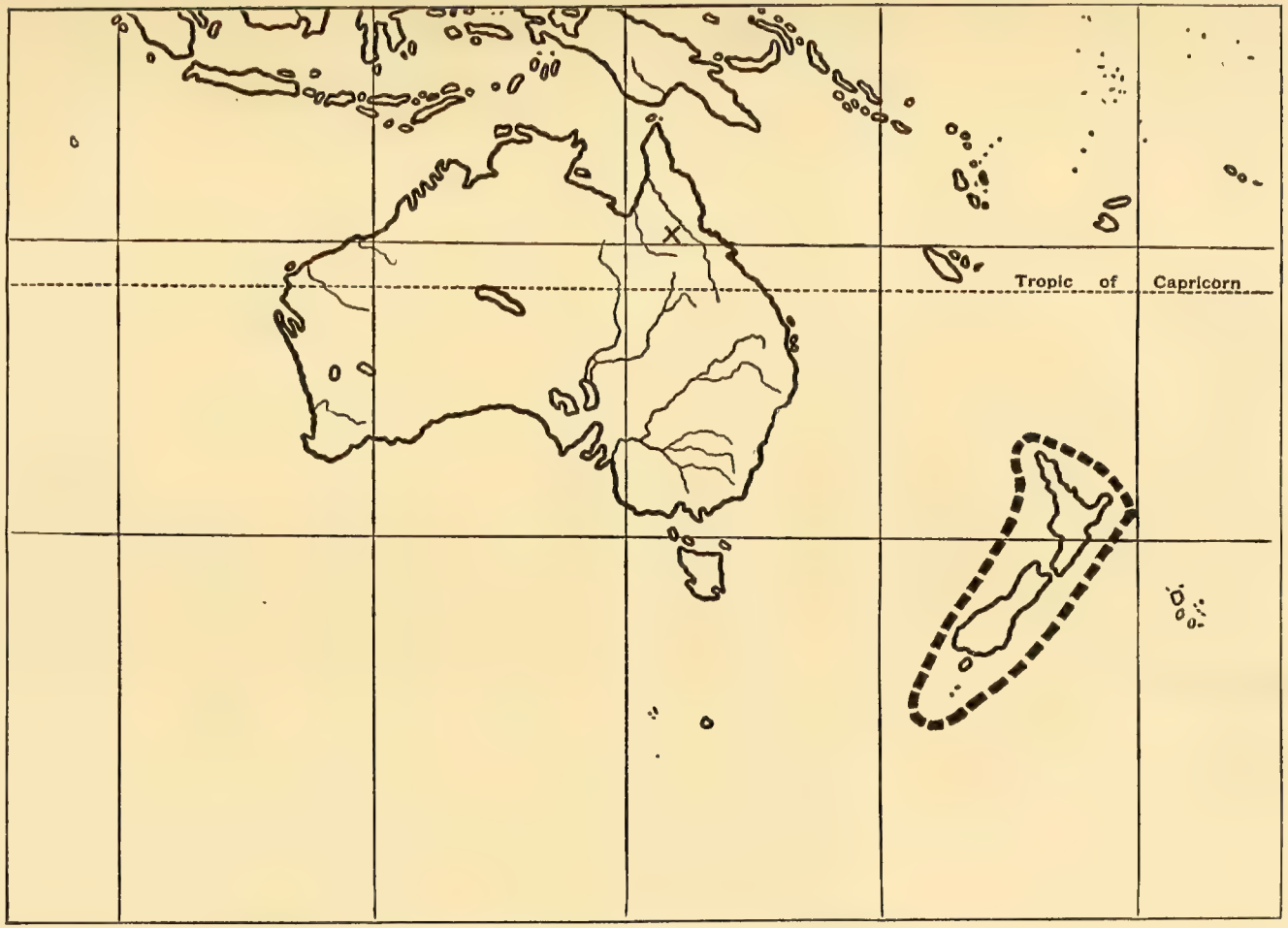
disappeared. "They are too simple for the changed times, and are fast succumbing to the inevitable." But as late as 1893, Buller (1893) found it "still very plentiful on the west coast of Wellington." Now it is probably to be found only in the more inaccessible or secluded localities. Myers (1923) in his paper on the status of endemic species has the following to say about it:

"This species, which is less dependent on large sheets of water than are any of the other species, is not very frequently recorded by ordinary bird-lovers. It is, however, fairly generally distributed. Guthrie-Smith (1921) considers that it will always survive on his run in Hawke's Bay wherever undrainable marshlands and boggy creeks remain. In two widely separated localities on the opposite (west) coast of the same Island it is not uncommon (1914, 1915). From a neighbouring district Major Wilson (1922) writes that it is rapidly disappearing if not already gone. In the far North it is decreasing considerably, and should certainly be no longer shot, at least for some seasons. The fact that it is protected apparently makes little difference." Since then Mr. Myers has told me himself that he cannot account for the very general decrease of this species.

Food Value. The flesh of this duck is held in high esteem.

Hunt. Before the advent of the white man the Maoris hunted these birds on a large scale, using the snare (Buller, 1905). With the white man came the large duck guns, and these are what has caused the greatest havoc.

Behavior in Captivity. Apparently this species has never yet been introduced into Europe or America. Mr. Blaauw writes me that he has not been able to obtain it alive.



MAP 74. Distribution of Brown Duck (*Elasmonetta chlorotis*)
Sporadic record indicated by cross (×)

AUCKLAND ISLAND DUCK

NESONETTA AUCKLANDICA G. R. GRAY

(Plate 51)

SYNONYMY

Nesonetta aucklandica G. R. Gray, Genera of Birds, vol. 3, p. 627, 1844.

VERNACULAR NAMES

English: Auckland Island Duck, Flightless Duck.

DESCRIPTION

ADULT MALE: Head and upper neck very dark gray with a sprinkling of iridescent green feathers at the back of the head and on the nape. Lower neck, mantle and scapulars brown with a green gloss, many feathers having wavy black and brown lines. Back and rump dark brown with a green gloss; tail black. Breast distinct chestnut-color fading into whitish and grayish on the abdomen. All the lower side is covered with indistinct blackish spots. Flanks barred like the scapulars and at the base of the lateral tail-coverts is an indistinct whitish patch. Under tail-coverts blackish. Wing dark brown without a speculum. Secondaries greenish on the outer web and tipped with whitish. Primaries very short and dark brown in color. Under wing-coverts brown and white, axillars brown and white.

Iris, according to Buller, dark hazel. Bill blackish brown. Tarsus and feet reddish brown. According to Ogilvie-Grant (1905b) the iris is dark brown, bill slaty gray and legs and feet yellowish brown with the webs darker.

Wing 127–144 mm.; bill 40; tarsus 35.

ADULT FEMALE: Much smaller than male but similar in a general way. The head has no green and the throat is whitish. The upper surface is brown with less green luster and no narrow black and brown bars. Crop region not so red as in male and under tail-coverts brown and not black.

Wing 125–130 mm.; bill 37; tarsus 31.

YOUNG MALE: Exactly like the female. Gradually some green appears on the back of the head, some barring on the mantle and scapulars and the under tail-coverts become darker.

YOUNG IN DOWN: "The general colour is dark olivaceous-brown, fading to pale fulvous-brown on the throat and fore-neck, and to dull fawn-colour on the breast and abdomen. There is a purer shade of dark-brown passing through the eyes and melting away behind. The rudimentary wings have an outer fringe of yellowish-brown; the produced filaments on the shoulders and mantle are of the same pale colour. The bill is dark-brown, with the terminal shield and the whole of the under mandible yellowish-brown. Legs and feet olivaceous-brown, the webs being darker; claws, yellowish-brown" (Buller, 1905).

DISTRIBUTION

THIS flightless species is confined to the Auckland Islands, where it is not uncommon (Buller, 1888; Ogilvie-Grant, 1905b; Hutton and Drummond, 1905; Waite, 1909).

GENERAL

VERY little indeed is known of the "Flightless Ducks" of the Auckland Islands. They inhabit the coasts of the islands and have usually been seen running about on the masses of brown seaweed or kelp, or climbing over the slippery rocks (Hutton and Drummond, 1905). They have, however, also been met with high up on the hillsides, along the water-courses (Waite, 1909).

Although called "flightless" it seems that these ducks have not yet entirely lost the power of flight. It is true that when pursued they make no attempt to use the wings, nor do they dive; instead they scurry away over the rocks (Hutton and Drummond, 1905). But Waite (1909) quotes a Captain Bollons as saying that they are able to fly for short distances, and that they reach the nesting places on the rocks in this manner. The Captain told him that he had "often seen the ducks rise at the foot of the cliff and by aid of the wings alone plump straight into the holes." Buller (1905) says that those who have seen them in the native state say that they perform a fluttering flight for a few yards along the surface of the water.

No doubt their perching and climbing powers are of great assistance to them in moving about on the rocks. Live specimens taken from the islands to New Zealand were placed in a cage with perches, and the birds readily availed themselves of these, perching almost as well as a true passerine (Waite, 1909). In regard to climbing, Buller (1905) tells of a pair which he obtained and planned to send to Europe. He placed them in a wire enclosure over three feet high. They immediately began to scale the upright netting and the male succeeded in getting over. Buller considers them semi-nocturnal in their habits, the male in question regularly climbing out of the enclosure in the morning and climbing in again at night in order to feed. This continued for about ten days, after which the birds were shipped to London.

Of its voice and feeding habits nothing appears to be known, and for the only note about nesting habits I am indebted to Waite's account. He states that Captain Bollons told him the following: "The eggs are laid in holes fifteen feet or twenty feet above sea level, excavations made by petrels being possibly utilized. As these holes are sometimes made in the face of a cliff, a mere walking bird would be unable to reach them. . . . Even by means of a ladder, he himself [Captain Bollons] has been unable to reach the nests." The size of the clutch and the color and measurements of the eggs, in fact the breeding season itself, are all unknown.

Attempts have been made to introduce this species into New Zealand. Buller (1905) set out a pair on Papaitonga Lake in the hope that they might breed. Whether or not he ever saw them again I do not know. Others were set out in the sanctuary on Kapiti Island near Wellington in 1907 and were seen there in the following year by Drummond (1909). Waite evidently refers to the same place when he speaks of the sanctuary in Cook Strait.

In regard to its present status we have no reason to suppose that this curious bird has diminished much since its discovery (Myers, 1923). The islands are uninhabited, although there is a shipwreck dépôt there, a provision for possible castaways. A ship calls there once every year.

The only importation into Europe was that of one specimen which reached the London Gardens in April, 1895. This bird survived for seventeen months (P. C. Mitchell, 1911).

FRECKLED DUCK

STICTONETTA NÆVOSA (Gould)

(Plate 52)

Synonymy

Anas nævosa Gould, Proc. Zool. Soc. London, 1840, p. 177.
Tadorna nævosa G. R. Gray, List Birds British Mus., vol. 3, p. 132, 1844.
Stictonetta nævosa Reichenbach, Avium Systema Naturæ, p. ix, 1852.
Stictonetta nævosa lesueuri Mathews, Austral Avian Record, vol. 1, p. 87, 1912.
Stictonetta branda Mathews, Birds Australia, vol. 4, pt. 2, pl. 215, 1915.

Vernacular Names

English: Freckled Duck, Speckled Duck.
Aborigines of Victoria: Gnall-gnall.
Australia: Monkey Duck, Grey Duck, Gadwall, Canvas-back.

DESCRIPTION

Adult Male: The whole head, neck and upper side is nearly uniform dark brown to black, freckled and spotted with buffy or whitish markings. The under surface is of the same character, but much lighter. Wing without a speculum, the wing-coverts and secondaries spotted like the rest of the upper side, but the primaries brown in color and without spots. Under wing-coverts white, irregularly barred with brown; axillars white.

"Iris light brown; bill greenish grey, becoming much darker at the tip, legs bluish green" (Gould). During the breeding season only, the bill becomes a brilliant red at the base, so Mr. D. Le Souef informs me.

Wing 220–231 mm.; bill 55; tarsus 42.

Adult Female: Similar to the male but not quite so dark about the head. Size slightly smaller.

DISTRIBUTION

The Freckled Duck, which is confined to Australia and Tasmania, is nowhere common. In northern Australia it has been found as far north as the Alligator River (Hartert, 1905). Carter (1904) met with a small flock near Cardabia Pool, in the vicinity of Northwest Cape, and he later met with the species on the Gascoyne River (Carter and Mathews, 1920). It was reported by W. B. Alexander (1921) as resident but rare in the Swan River region. At Moora, in the region about Perth, it is an uncommon bird (Orton and Sandland, 1913). In South Australia it has been found on the Eyre Peninsula (R. Hall, 1910; White, Mellor, in Mathews, 1914–15), about Adelaide and on the lower Murray (Mellor, in Mathews, 1914–15). Captain White says he has met with it in the interior during droughts, and Mr. L. Reese writes me from the Marree district, in the interior, that in some years the species is numerous there. Trezise (1918) says it is fairly plentiful on the lakes near Robe (South Australia) and McGilp (1923) recorded it for the first time in the Lake Frome district.

In Tasmania it is rare and specimens have been taken very occasionally since 1884 (Legge, 1905; North, 1913; R. Hall, 1924). It is an uncommon bird near Lake Boga, Victoria (A. C. Stone, 1912), but North (1913) says he has seen it not infrequently in the Melbourne Market. In New South Wales it is a rare bird, but is known to have bred there (North, 1913; F. C. Morse, 1922).

FRECKLED DUCK

Female Male

MAP 75. Distribution of Freckled Duck (*Stictonetta nævosa*)
Sporadic records indicated by crosses (×)

In Queensland it is extremely rare; the only record I have come across is that of North (1913) who received a specimen from Toowoomba.

GENERAL HABITS

This is not only the rarest but perhaps the most peculiar of all the peculiar Australian ducks. It is certainly not closely related to any of the shoal-water ducks and is particularly un-ducklike in its color scheme, besides lacking the wing-speculum. The bill is very narrow, rather high at the base and considerably "dished"; that is, it is markedly concave on the dorsal profile. Most extraordinary is the conformation of the trachea, which is entirely different from that of any other duck. The tracheal bulb seen in the males of all surface-feeding ducks is practically absent, and in its place there is only a slight swelling at the bifurcation of the trachea. The trachea of the female is simple and cylindrical throughout, but in the male there are two expansions, the lower one a little below the middle of the trachea and the upper one about midway between the lower one and the pharynx. The lower one is the larger. In both expansions the trachea is about doubled in diameter and compressed, so that when viewed from the front they are not conspicuous (Ramsay, 1878; A. J. Campbell, 1899).

Practically nothing is known of the life-history of this bird. R. Hall (1909) describes it as "quiet, tame and sleepy" with a voice like "the grunt of a Berkshire pig," but Mellor (in Mathews, 1914–15) speaks of it as a somewhat shy bird, not easily stalked. Charles Barrett writes in a similar vein about some he saw at Eyre's Peninsula, South Australia. He tells me that he has never heard the call-note but that there is said to be another sound like the "mewing of a cat."

C. F. Belcher relates (Birds of the District of Geelong, Victoria) that their habits are eccentric. A little company of them will come down to the water after dusk, pitching one here, one there, yards away from each other. Each individual will remain for hours in the position it originally took up, not even feeding. A shooter informed him that he once came on some Freckled Ducks on a Victorian Lake, sitting in shallow water, head under wing. He called out to startle them, then rattled a board on his punt without result. At last he fired and killed one bird, when the others flew off without haste.

The few nests that have been found were in herbage or *Polygonum* bushes, about two feet above the water, with a small platform by which to approach the nest. They appear to be always on or near the ground. The clutch seems to number seven eggs, which are thick ovals in form, smooth, highly lustrous and of a pale creamy-brown color. More than seven have been reported. The average size of six eggs as given by North (1913) is 61 by 44 mm. The breeding months in central New South Wales are September, October, November.

The Freckled Duck has never been imported alive into America or Europe. It has, however, been kept in the Melbourne Zoölogical Gardens, though it has never bred there, so Mr. D. Le Souef writes me. No hybrids have ever been recorded.

BLACK-HEADED DUCK

HETERONETTA ATRICAPILLA (MERREM)

(Plate 53)

SYNONYMY

Anas melanocephala Vieillot (*nec* Gmelin), Nouv. Dict. des Sci. Nat., vol. 5, p. 163, 1816.

Anas atricapilla Merrem, in Ersch and Grube's Encyclop., sect. 1, vol. 35, p. 26, 1841.

Anas nigriceps Lichtenstein, Nomenclator Avium, p. 101, 1854.

Heteronetta melanocephala Salvadori, Atti Soc. Ital. Sci. Nat. Milano, vol. 8, p. 574, 1865.

Fuligula melanocephala Schlegel, Mus. Pays-Bas, Anseres, p. 32, 1866.

Nyroca melanocephala Eyton, Synopsis Anatidæ, p. 118, 1869.

VERNACULAR NAMES

English: Black-headed Duck.

German: Schwarzkopfente.

French: Canard à tête noire.

Spanish: Pato cabeza negra, Pato rinconero, Pato de color pardo.

DESCRIPTION

ADULT MALE: Whole of head and upper part of neck black, except the chin which is usually, but not always, white. Whole upper surface black, minutely freckled with rufous. Upper breast brownish; all the rest of the lower surface silvery white, with brown showing through. Sides, flanks, and under tail-coverts rusty brown, vermiculated with black. Speculum absent, and this area the same color as the rest of wing, but outlined by an anterior and a posterior white wing-bar. Primaries blackish; tail blackish, freckled more or less with rufous. Under wing-coverts white, except the greater which are gray. Axillars white.

Bill blackish according to Sclater, with a basal spot on each side flesh-color. Feet horny-brown. Wing 160–176 mm.; bill 46; tarsus 33.

ADULT FEMALE: Very similar to the male, but the head, except the crown, less black. Cheeks freckled. There is a post-orbital light-colored stripe, sometimes prolonged to in front of the eye. Chin and throat dirty white. Remainder of upper and lower surface very similar to the male.

Iris "wood-brown." The upper mandible, according to Durnford, is dark brown with a tinge of yellowish red at the base. The legs and feet are pale slate and the webs darker. Size about the same as the male as nearly as I can see from the thirteen specimens which I have measured.

IMMATURE MALE: Like the female. The top of the head and the cheeks are apparently the first to become black, followed by changes to darker coloring on the chin and upper throat.

DOWNY YOUNG: No information.

BLACK-HEADED DUCK

Female Male

DISTRIBUTION

This rare bird seems to be confined to the basin of the La Plata, and central Chile. It has been found in Paraguay (H. von Ihering, 1904; Bertoni, 1913) and has been recorded from the following Provinces of Argentina: Tucuman (Lillo, 1902); Rioja (Giacomelli, 1907); Mendoza (British Museum); and San Juan (American Museum of Natural History). In Buenos Aires Province it is not common (P. L. Sclater and Hudson, 1889; A. H. Holland, 1892; Hartert and Venturi, 1909; C. H. B. Grant, 1911; E. Gibson, 1920; Wetmore, MS.). It has been recorded from Uruguay (Tremoleras, 1920) and from Rio Grande do Sul, southeastern Brazil (H. and R. von Ihering, 1907). In Chile, Lane (1897) met with it on the Rio Pilmaiguen. The British Museum has specimens from Santiago. Presumably the species is found only in the central parts (Quijada, 1910). When Lord William Percy was in Santiago, a monk in charge of some birds in a monastery there told him of seeing *Heteronetta*(?) in Cautin Province in December (1923?). Percy obtained a twenty-year-old skin at Concepcion and tells me that the bird must be very rare in that region.

GENERAL HABITS

Less is known of this species than of any other South American duck, excepting perhaps the Brazilian Merganser. Systematically it certainly has very little in common with the surface-feeding ducks with which it is placed. Its affinities are uncertain, not only on account of the structure but also because of its habits. The male has no *bulla ossea;* the trachea is simple, although the middle third of it is soft and swollen and about double the diameter of the remainder, as it is in some diving ducks. On the other hand it has the slender body, narrow, light bill, and small feet of a surface-feeder.

Suggestive of relationship to the diving ducks was the discovery by Dr. A. Wetmore (*in litt.*) that the male has a large œsophageal throat-sac. This is not like the tracheal air-sac found in the spiny-tailed ducks (Oxyurinæ). It is situated at the upper end of the œsophagus, is 50 or 60 mm. long, and in the region of the lower jaws is projected into two sacs which connect with the mouth. The bird must have some general resemblance to the spiny-tailed ducks, because according to P. L. Sclater and Salvin (1876) hunters in Chile used to confound it with the Ferruginous Ruddy Duck (*Oxyura ferruginea*). It has the curious full, loose neck-skin of the ducks of that genus. It dives as actively as any true diving duck, though the hind toe lacks the broad lobe characteristic of the subfamily Fuligulinæ. The tail-coverts are nearly as long as the rectrices, and the wing is rather short. Dr. Wetmore thinks this species may be intermediate between the surface-feeders (*Anas*) and the spiny-tailed ducks (Oxyurinæ).

These birds are fond of reed-beds, and are exceedingly hard to observe because they do not fly about, but prefer to hide when disturbed. They are also very shy and retiring in their habits (A. H. Holland, 1892; C. H. B. Grant, 1911; E. Gibson, 1920).

Some interesting notes, made by Dr. A. Wetmore, have been recently sent to me; I quote freely from them. The birds were found by him only on the *cañadones* on the

Estancia Los Yngleses, Province of Buenos Aires. "They frequented pools surrounded by rushes, where the water was from two to three feet deep, and were shy and retiring, so that it was difficult to observe them. On my first encounter I found two pairs on a small pond with Coots, and other ducks. To my astonishment the Black-headed Ducks dove when startled and disappeared like so many grebes, evidently seeking the shelter of the rushes. Another pair was observed on November 9, 1920, when I was fortunate enough to secure the male, though both birds dove instantly at the flash of the gun. The female disappeared and was not seen again. When in the water the birds suggest Ruddy Ducks (*Oxyura jamaicensis*), though the tails are not held at an angle as in the ducks of that genus.

"Black-headed Ducks were evidently breeding during the first week in November. The females noted swam about with their heads erect, behaving like other ducks. Males followed them or faced them with necks drawn in and throats puffed out, at intervals raising the point of their bills and giving a low note, *quah-quah*, barely audible at forty-five yards. It is possible that in diving quickly the birds use wings as well as feet, but on this point I am not certain."

It is very extraordinary that no nest of this species has ever been found, or at any rate described. This gap in our knowledge of the bird's life-history may be due to the fact that the species is extraordinarily parasitic, depositing its eggs in the nests of such birds as the Coscoroba Swan (*Coscoroba*), the Crested Screamer (*Chauna*), the South American Limpkin (*Aramus*), Gulls (*Larus*), Coots (*Fulica*), White-faced Ibises (*Plegadis*), Black Rails (*Pardirallus*), and even the nests of the Chimango, or Southern Caracara Hawk (*Milvago chimango*). Ducks' eggs found in such situations were at first attributed to the Rosy-billed Duck (D. Rodríguez, 1918), but a later writer (Daguerre, 1920) has discovered that these parasitic eggs are slightly different from those of the Rosy-bill, being more whitish and the surface very finely granulated; they are also thicker and more blunt. Most convincing is his statement that these supposed Rosy-bill eggs are identical with a mature egg which was taken from the oviduct of a female of the Black-headed Duck. It may be remarked in this connection that the Black-headed Ducks are not uncommonly seen in the company of Coots (E. Gibson, 1920; Wetmore, MS.).

Because of the scarcity of information about the nesting of this duck, I think it is worth while to quote a tale that was related to Lord William Percy in Santiago, in 1923. A monk (Flaminio Ruiz) in charge of the museum there said that when he was in Cautin Province in December he saw from his boat in the marshes a duck come from a hole in the fork of a tree forty feet from the ground. It was, he thought, a Black-headed Duck, and the young birds from the nest came tumbling out one after another on to the water beside the old bird below.

This duck has never been imported alive into North America or Europe, and no hybrids have ever been described.

MAP 76. Distribution of Black-headed Duck (*Heteronetta atricapilla*)

SUBFAMILY FULIGULINÆ

SUBFAMILY FULIGULINÆ

The most obvious external character distinguishing the ducks of this subfamily is the expanded, flap-like membrane forming the lower part of the hind toe. This is in correlation with the slightly greater development of the other swimming membranes of the foot for use in diving, for as compared with the Anatinæ, the feet are notably larger in proportion. The toes are relatively longer with broader webs, the outer toe scarcely, or not, shorter than the middle one. The tarsi, on the other hand, are usually shorter in comparison, but agree with those of the Anatinæ in being scutellate in front. The sexes are differently colored, and while the males have a large osseous bulla at the lower end of the windpipe, as in the surface-feeding ducks, it generally differs in having the bony walls perforated by irregular openings covered by membrane.

The ducks of this group are often known as the diving ducks or sea ducks in distinction from the surface-feeding or river ducks (Anatinæ), for much of their food consists of animal or vegetable matter which they obtain by diving in moderate depths. For this, their feet with enlarged swimming membranes are especially adapted, while in general form they appear more stoutly built, less slender, than the surface-feeders. In winter they are prone to frequent the seacoasts along whose open waters food is usually obtainable without great difficulty.

The following key, based on that of Salvadori (1895) indicates the external characters of the genera here recognized.

A. Bill rather broad and flattened; primaries partly whitish with the tip and outer web of the first three or four brown.

a. Upper mandible with prominent indentations; head of male crested.....*Netta*

b. Upper mandible with indentations not prominent; head not crested.

1. Bill convex at base; outline of loral feathering straight and inclined backward.
.....*Metopiana*

2. Bill smooth, not convex or rounded at base.....*Nyroca*

B. Primaries uniform dark brown or blackish.

a. Central tail-feathers narrow, short, curled; wings very short; bill very strong....*Tachyeres*

b. Central tail-feathers not curled up; no short, stiff feathers on head of adult male.

1. General plumage of males not black.

aa. Head crested; bill strong and thick.

Tail-feathers somewhat rounded at the tip; edges of upper mandible not bent in; males with glossy head.....*Bucephala*

Central tail-feathers of male very long and pointed; edges of upper mandible partly bent inward.....*Harelda*

bb. Head not distinctly crested; bill conical, tapering.....*Histrionicus*

2. General plumage of males black, of females grayish brown, not barred.....*Oidemia*

c. Central tail-feathers not curled up; some patches of shorter stiff feathers on the head of males.

1. Upper mandible fringed with a soft membrane toward tip; lower mandible with tip flat and spatulate ..... *Camptorhynchus*

2. Upper mandible not fringed with a membrane near tip; rather narrow and pointed; tertials, especially in males more or less falcate.

   aa. Edges of upper mandible bent inward; lower mandible with apical portion flat and almost spatulate ..... *Eniconetta*

   bb. Edges of upper mandible not bent inward.

   Base of culmen extended back on to the forehead in two narrow divergent angles. ..... *Somateria*

   Base of culmen without such prolongations, the feathering extending quite to the nostrils ..... *Arctonetta*

RED-CRESTED POCHARD

NETTA RUFINA (PALLAS)

(Plate 54)

SYNONYMY

Anas rufina Pallas, Reise Russ. Reich., vol. 2, appendix, p. 713, 1773.

Anas cinerea S. G. Gmelin, Reise Russland., vol. 2, p. 184, pl. 18, 1774.

Anas ruficeps Pallas, Kongl. Vetenskaps Acad. Handl., Stockholm, vol. 40, p. 28, 1779.

Anas sjurakan De Brujn, It. Moscov., p. 336, pl. 182, fig. D.

Branta rufina Boie, Oken's Isis, 1822, p. 564.

Fuligula rufina Stephens, General Zool., vol. 12, pt. 2, p. 188, pl. 54, 1824.

Platypus rufinus Brehm, Lehrbuch Naturges. Europ. Vögel, vol. 2, p. 826, 1824.

Netta rufina Kaup, Natürlich. Syst., p. 102, 1829.

Callichen ruficeps Brehm, Oken's Isis, p. 999, 1830 (*nomen nudum*); Vögel Deutschlands, p. 922, 1831.

Callichen rufinus Brehm, Oken's Isis, p. 999, 1830.

Callichen subrufinus Brehm, Oken's Isis, p. 999, 1830 (*nomen nudum*); Vögel Deutschlands, p. 924, 1831.

Callichen micropus Brehm, Oken's Isis, p. 999, 1830 (*nomen nudum*); Vögel Deutschlands, p. 925, 1831.

Mergoides rufina Eyton, Cat. British Birds, p. 57, 1836.

Aythya rufina Macgillivray, Manual British Birds, p. 191, 1842.

Tadorna? pnoe Hodgson, Gray's Zool. Miscellany, p. 86, 1844.

Callichen rufescens Brehm, Vogelfang, p. 378, 1855.

Fuligula ruficrista C. F. Dubois, Planches Coloriées Oiseaux Belg., vol. 3, p. 277, 1860.

Callichen rufa Koenig, Journ. f. Ornith., vol. 36, p. 285, 1888.

VERNACULAR NAMES

English: Red-crested Pochard, Orange Duck, Red-crested Whistling Duck, Rufous-crested Duck, Indian Pochard.

German: Kolbenente, Gelbkopfente, Rothbuschente, Rotkopfente, Gehaubte Pfeifente, Rothals, Gelbschopf, Karminente, Bismatente, Königsente.

French: Canard siffleur huppé, Nette rousse, Morillon roussâtre, Morillon â huppe rousse, Canard rufin, Brante roussâtre, Jaffre roux, Rougéon, Canard mû, Boni d'Espagne, Canard Espagnol.

Italian: Germano turco, Teston, Anara turca, Chiosso, Capone schiavonisco, 'Natra turca, Testa di Turcu, Anitra tuppata, Fistione turca, Caporosso maggiore, Magasso tresso, Magasso col zuffo.

Spanish: Sivert, Anade silbaldor cristato, Anache gabais, Anate silbon, Rech vermell.

Dutch: Krooneend.

Russian: Nyrok krasnonosyi.

Polish: Kaczka helmiasta.

Danish: Rödhovedetand.

Swedish: Rödhufvade dykand.

Bosnian: Gogolj.

Bulgarian: Almabas.

Croatian: Crvena patka.

Czech: Kachna zrzohlava.

Magyar: Tollagos récza.

Arabic: Jankeljha.

Maltese: Brajmla tat'toppu ahmar.

Egyptian: Won'nas.

Kirgis tribes: Kara-igiriok Kizyl-bach.

Indian: Lall-chonch, Lall-sir (Northwest Provinces); Hero-hans, Chobra-hans (Bengal); Doomer, Sunwa (Nepal); Rattoba (Sind); Nool-gool (Kabul); Kigil-bash aurdak (Turki).

DESCRIPTION

Adult Male: Whole top of head pale chestnut, the feathers elongated and forming a crest. Remainder of head very close to the Prussian red of Ridgway (1912). Back of head, lower neck and mantle black, changing into a warm brown on the scapulars, some of which are white, forming a partly concealed white patch at the shoulder. Back black, changing to a greenish iridescence on the rump and upper tail-coverts. Tail gray. The lower surface is all black except the sides which are white mixed with brown. Wing-coverts white at the carpal joint and gray like the tertials for the remainder. Secondaries white except the tips, forming a conspicuous white speculum. Primaries dark gray on the outer web and at the tips; cream-colored on the inner web. Under surface of wing white.

Iris bright red in breeding season, apparently lighter red to hazel at other times. Bill vermilion red, almost blood-color, a little lighter on the nail. Legs and feet, orange to yellow-orange. I have noticed that in captive specimens the legs may become a dirty black color with yellow around middle of tarsus. The leg color of ducks in confinement is seldom as brilliant as in wild specimens.

Wing 250–268 mm.; bill 46–51; tarsus 42–45.

Weight, according to Hume, up to 2 pounds, 14 ounces (1.3 kilograms).

Adult Female: General color plain brownish gray all over, darker on the occiput and back. Speculum nearly as in the male.

Iris brown or reddish brown. Bill dusky black, becoming paler and more reddish toward the nail. Legs and feet dull yellow.

RED-CRESTED POCHARD

Female Male

Wing 255 mm.; bill 48; tarsus 42.
Weight up to 2 pounds, 6 ounces (Hume) (1.07 kilograms).

Immature Male: Millais says the young male is somewhat similar to the female, only darker and with an indication of a crest. The centers of the feathers of the under parts are brown instead of gray and the back and front of the breast is a much darker brown. The young male and female are easily recognized by the usual immature feathers on the lower breast, vent and tail-coverts, and by the frayed tail. The soft parts are like those of the female.

Eclipse Plumage: There is a very definite eclipse plumage which in general resembles the adult female. I have never seen a specimen myself. It may be distinguished from the adult female by the grayer upper wing-coverts, whiter speculum, more rusty head-coloring and by a brighter-colored iris (Hartert, 1920a). See Millais' plate (1913).

Young in Down: The upper parts are dull olive gray; under parts buff or yellowish gray; a buff spot on either shoulder; a yellowish gray stripe passes over each eye, and in front of and behind the eye runs a dark stripe which divides behind the eye.

Iris dark brown. Bill reddish brown with the nail white. Feet ash gray with a green tinge; legs and toes narrowly edged with yellowish white (Millais). In the specimens which I examined in the British Museum the color was pale yellowish brown above and almost white below. The face was uniform pale yellowish except for a very faint trans-ocular darker streak. The body-patches on wings, scapulars and rump region were rather poorly defined.

DISTRIBUTION

Few palæarctic ducks have a more peculiar distribution than the Red-crested Pochard. There is hardly a single locality in Europe in which it is common, and throughout a very large part of its range its appearance is irregular and sporadic. In the British Isles it is a "very rare vagrant," having appeared but once in Ireland, near Tralee, in January, 1881 (Ussher and Warren, 1900); and but thrice in Scotland, once near Craignish, in January, 1863 (R. Gray, 1871) and on two other occasions in Argyll (Witherby *et al.*, 1919–22). In England it has occurred a number of times since 1818 in the autumn and winter and chiefly on the east coast. Witherby's Handbook (Witherby *et al.*, 1919–22) lists a number of records for Norfolk, one for Northumberland, one for Yorkshire, two for Lincolnshire, two for Cambridgeshire, several for Suffolk, one for Essex, a flock of eighteen seen at the mouth of the Thames, one for Staffordshire, a flock seen at the Tring Reservoirs, a flock seen in Sussex, one each for Hantshire, Dorset, Cornwall, Pembroke and Westmoreland, and two for Devon.

British Isles

On the Continent the species is not known ever to have occurred north of the Baltic. In Germany it has certainly nested on the Krakower Lakes in Mecklenburg (Wüstnei, 1898, 1900, 1902), on the salt ponds near Eisleben in Saxony (Baldamus, 1870; A. Müller, 1880) and in Silesia (Floericke, 1898). According to Rohweder (*fide* Naumann, 1896–1905) it has bred in Holstein, too. Beyond this the Red-crested Pochard is known to have occurred rarely in Swabia, Hessia, Silesia, Lusatia, Pomerania, Anhalt, Bavaria (Naumann, 1896–1905), Rhine Provinces (Le Roi, 1906–07), Brandenburg (Schalow, 1915) and eastern Prussia (Tischler, 1910). In Poland a specimen was taken near Lublin (Taczanowski, 1888) and others have been seen in Galicia where it has probably bred (von Mojsisovics, 1887; Millais, 1913). Other examples have been taken in Kurland and Livland (Loudon, 1909) and near Pskof (Zarudny, 1910) though records for St. Petersburg are probably erroneous (Büchner, 1885). There are, I believe, very few records for Denmark, — July, 1872, on Hindö (Lütken, 1885; Collin, 1895), — but at least a dozen for Holland, where some are thought to breed (van Oort, 1905, 1911), while in Belgium it seems to be an even

Germany

Poland

Baltic States

Northern Russia

Denmark

rarer bird. Six were seen near Namur in August, 1902 (Dubois, 1912). Its status in northern France is about the same. Specimens have been taken or seen near Beaumont and Arras (van Kempen, 1910), in the departments Loire-Inférieure, Marne et Loire and in the Vendée (Bureau, 1910), in Normandy (Ternier and Masse, 1907), Côte d'Or (Paris, 1910), Picardy (d'Aubusson, 1911) and Lorraine (Holandre, 1851). Poncins (1910) has shown that the species bred regularly between 1897 and 1909 near Lailly, Loiret, while in Provence it seems to be increasing in numbers as a breeding bird, and at the same time to be extending its range. Older writers, like Jaubert and Lapommeraye (*fide* Dresser, 1871–81) or J. W. von Müller (1856) considered it very rare and of irregular occurrence in winter. Clarke (1895), I believe, first discovered it nesting in the Camargue, where great flocks are now seen in April and May (Aptel, 1915) and the breeding range is steadily being extended northward (l'Hermitte, 1916).

Holland
Belgium
France

There are no records of the Red-crested Pochard occurring in Portugal, but in Spain it is not a very rare bird, at least in certain parts of the east. Specimens have been taken in Gerona, Madrid, Murcia and Seville (Reyes y Prosper, 1886; Arévalo y Baca, 1887) while in the Albufera of Valencia it is a common bird in winter (Lilford, *fide* Dresser, 1871–81; H. Saunders, 1871). Recently A. Chapman and Buck (1910) have reported its breeding in La Mancha, central Spain, and it has long been known as a sedentary bird on Majorca in the Balearics (A. von Homeyer, 1862; Barcelo, *fide* Reyes y Prosper, 1886). In Sardinia, also, it is a breeding as well as a wintering bird (Salvadori, 1865; Brooke, 1873), but in Corsica it is only a very occasional winter visitor (Picchi, 1904; Jourdain, 1912). There are only about four reliable records of its occurrence on Malta (Despott, 1917), while in eastern Sicily it is an abundant nesting species (Saunders, Doderlein, *fide* Dresser, 1871–81; Giglioli, 1889–91). Hartert (1920a) thinks some may possibly nest in Apulia, where, according to Giglioli's (1889–91) informants, it is a regular winter guest. Throughout the rest of Italy it is known only as an occasional winter visitor, there being records for the Marches, Tuscany, Liguria, Emilia, Lombardy and especially Venetia (Giglioli, 1889–91; Picchi, 1904). In Switzerland specimens occasionally appear on the lakes of the northern lowlands, and there are rather unreliable records of its having bred in Bas-Valais and near Lake Neuchatel (Fatio, 1904; Poncy, 1908).

Spain
Italy
Switzerland

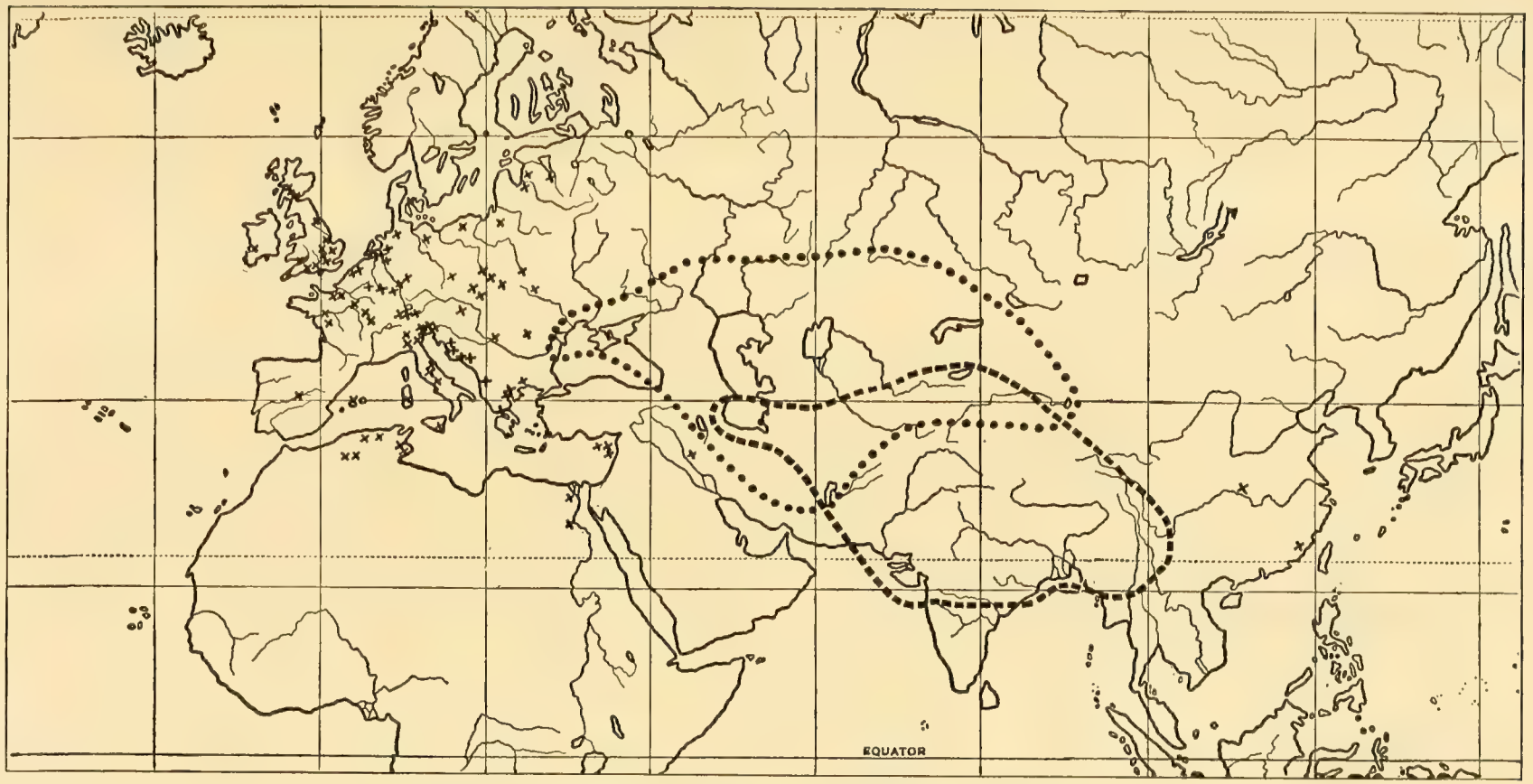
In the Tyrol this Pochard has been reported as a rare winter guest (Althammer, 1857) and there are scattered records of its occurrence at Salzburg and Neusiedlersee, Austria (von Mojsisovics, 1886) as well as at Prague, Brünn and Neuhaus in Czecho-Slovakia (Dresser, 1871–81; von Mojsisovics, 1886). According to Fritsch (1872) it has nested near Böhmisch-Leipa, and there is a record of its having bred near Fehermocsar, southern Hungary, in 1847 (Hartert, 1920a). Nothing is known of its status in Jugo-Slavia beyond Kolombatovič's (1903) remark that it is a rare winter bird in Dalmatia excepting along the Narenta. In Montenegro it is occasionally seen about Lake Scutari in winter (Reiser and von Führer, 1896), while in Bulgaria it is a rare winter visitor (Reiser, 1894). It is said to breed in the Dobrudja (Elwes and Buckley, 1870) and it has been recorded from Rumania by both Lintia (1909) and Lodge (1909). Danford and Harvie-Brown (1875) considered it rare in Transylvania in May. G. C. Taylor (1872) met with it in the Crimea in May. The breeding range in southern Russia probably covers the governments of Tauria, Cherson, Ekaterinoslav and Charkow, extending north and east along the Volga to about 52° or 53° (Czernay, 1852; Seebohm, 1883; Moeschler, 1853; Becker, 1853; Hartert, 1920a).

Succession States
Balkans
Southern Russia

Sladen (1918) has recorded the species as evidently breeding in some numbers on Lake Ardzan, Macedonia, and Harrison (1918) speaks of it as common in winter about Saloniki. Powys (1860) found it an abundant winter visitor near Butrinto, but in Greece proper it is only a very rare winter bird (von der Mühle, 1844; Lindermayer, 1860).

Greece

Passing now to northern Africa I think we may safely ignore de Rochebrune's (1883–85) statement that it occurs in Senegambia and perhaps also Carstensen's (1852) assertion that the species



MAP 77. Distribution of Red-crested Pochard (*Netta rufina*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

breeds in Tangiers. But in Algeria it has been found as far south as Wed Rhir and El Aghouat (Tristram, 1860), and it is known to breed on Lake Zana (Salvin, 1859) and quite commonly on Lake Fetzara (Zedlitz, 1914). I have no doubt that some nest in Tunis also, where, according to J. I. S. Whitaker (1905) it is not uncommon in winter and spring. In Egypt it is undoubtedly a rare bird, though not so rare as was formerly supposed. Von Heuglin (1873) claims to have seen it in Upper Egypt in winter, and A. E. Brehm (1854) says that he saw it on Lake Menzaleh. Nicoll (1919), after finding specimens on the last-named lake, as well as at Giza, Wadi Natron and in the Delta, concludes that it is probably an annual winter visitor to both Upper and Lower Egypt. There are no records of specimens occurring in Palestine or Syria, but Bucknill (1911) speaks of large flocks seen in Cyprus from December, 1909, to February, 1910. The species is not known to occur in Asia Minor or the Euphrates countries, though Hume and Marshall (1879) say that specimens have been sent from near Bagdad.

North Africa

Asia Minor

In the Caucasus the Red-crested Pochard is a resident and breeding bird on Lake Gokcha, while at Baku and Lenkoran it is common in winter; in the interior a few sometimes winter about Tiflis (Radde, 1884). The species winters on the southwestern Caspian too (Radde, 1886) and evidently also in northern Persia (Sharpe, 1889) and southern Transcaspia (Stolzmann, 1893) as well as along the Persian Gulf (Zarudny, 1911). Throughout Persia it breeds in suitable localities (Zarudny, 1911; Blanford, 1876) and the same holds for Transcaspia, where it is abundant during the nesting season (Loudon, 1910; Zarudny, 1889–90). Farther north the breeding range includes the western Kirgis steppe, rarely east of the Aral Sea (Nazarow, 1887; Suschkin, 1900, 1914), but the whole of Russian Turkestan (Lansdell, 1885; Menzbier, 1888). Stolzmann (1897) has recorded it from Ferghana and there are specimens from the Tianshan (Schalow, 1908; British Museum). Northward it has been found on the Ala-kul early in May (Finsch, 1877), near Akmolinsk in June (Bianchi, 1902) and once, in April, 1911, near Tara, Tobolsk Government (Ushakov, 1913). It seems to be a regular breeder on the upper Irtysch (Poliakov, 1916), and on the lower Ili it is said to be the commonest duck in the breeding season (Smallbones, 1906).

Caucasus

Central Asia

The eastern limit of its range is not well defined. It nests in Kashgaria and Yarkand (Koslow, 1899; Oustalet, 1894) and specimens have been taken in October at Tikellik on the Tarim (Oustalet, 1894), in the Gobi in May (1901) and during migration on the Lob-nor (Bonvalot, 1892; Koslow, 1899). Great numbers even winter as far north as the Issyk-kul (Smallbones, 1906) and on the Bagrash-kul (Koslow, 1899). In Tibet, however, it is a rare bird, and Capt. F. M. Bailey (1911) reports only two seen in four years at Gyantse.

Probably the chief winter resort is in India and neighboring regions. In Afghanistan and Baluchistan it is fairly common (C. H. T. Whitehead, 1909; Meinertzhagen, 1920; Baker, 1921) and in India proper it is a very common bird, at least in the north. Ward (*fide* C. H. T. Whitehead, 1909) says it is common in Kashmir in February, while in India it is common in the Northwest Provinces, the Punjab, Sind, Rajputana, Oudh, central India and the northern part of the Central Provinces as well as in most of Bengal. Eastward, in Assam, it becomes somewhat less abundant, but is by no means rare, extending as far as Sadiya. In Cutch, Kathiawar, and throughout the Deccan it is very rare if it occurs at all. It occasionally visits Kullu, Kumaon, and Nepal, and has been procured in small numbers from Manipur (Hume and Marshall, 1879; Baker, 1921). Layard's belief that he observed it in Ceylon probably rests on error (Wait, 1917). Farther east it has been taken near Bhamo (Blyth, 1875), and in other parts of Burma (Baker, 1921), though in the South Shan States it is not common (Rippon, 1901). For China proper there are only a few records: one taken on November 22 near Kiating, western Szechwan (Thayer and Bangs, 1912) and that of another collected near Foochow in December, 1915 (La Touche, 1917), and two at Shasi market, Hupeh, in winter (La Touche, 1922). Ghidini's (1911) report that this and other species of ducks were shipped in hundreds to European markets from the

India

China

lower Yangtse must be a mistake although this duck may not be really rare in China. It remains to mention the occurrence of a specimen in America, which was found in the Fulton Market, New York, on February 2, 1872, and was presumably taken on Long Island Sound (Ridgway, 1881).

North America

Migration

Very little can be said about the seasonal movements of this bird, especially as regards the western portions of its range. The birds that come to Germany and northern France arrive about the end of March or in early April and generally leave before the middle of October, though in mild years some have been seen in Germany as late as early December and some of the records for central Europe are for wintering birds (Baldamus, 1870; Naumann, 1896–1905; Poncins, 1910). Those that merely pass through Italy are usually seen in late February or early March and again in November. On the Caspian they generally leave for the north in March. In India they are regarded as late arrivals, the earliest and latest dates given by Hume and Marshall (1879) being October 21 for arrival and April 8 for departure. The bulk arrive during November and leave about the middle of March (Hume and Marshall, 1879).

Summer and winter distributions over much of its range are so poorly defined that a clear picture cannot be drawn with our present knowledge.

GENERAL HABITS

Although a typical diving duck, this species probably deserves generic rank, for it is quite distinct in general appearance, habits and distribution from other fuliguline ducks, the Pochards and Scaups. It is more at home on land than some of its relatives and is often seen feeding in shallow water in the manner of shoal-water ducks. Its characteristic haunts are large sheets of moderately deep still or slow-moving water with abundance of pond-weeds and other aquatic plants. It is only exceptionally seen on the seacoast, but in certain regions shows a partiality for brackish or saline lakes. In the breeding season it naturally seeks entirely different surroundings, preferably small secluded pools with dense reed-beds or shrubbery.

This is a showy duck and the male can hardly be confused on the water with any other species. At great distances where the crimson bill, rufous crest, and white wing-bars are no longer visible it may be mistaken for a Common Pochard. The female is an inconspicuous duck, but the light-colored reddish tip of the bill and the white wing-speculum together with the contrasting colors of cheeks and crown will serve as field-marks. During flight the wide white wing-patch is very conspicuous.

Wariness. This Pochard is recognized by almost all observers as timid and easily made very wary when once shot at. In India, where Hume used to hunt them with a swivel-gun, he found they could be easily approached to within the proper range, until they had once been shot at, but they usually stayed just out of reach of the ordinary gun (Hume and Marshall, 1879). In the breeding season they are not only shy, but keep well concealed in dense reed-beds (Sladen, 1918). Only Radde (1884), who observed them during the winter on the open sea near Lenkoran, asserts that there they are not at all shy but allow a small boat to approach within gunshot.

Daily Movements. Like other diving ducks Red-crests feed principally in the morning and afternoon with an inactive period in the middle of the day. Whether or not they commonly feed by night it is difficult to say, but Hume and Marshall (1879) seem to think that this is the case, especially where their day-time quarters happen to be on waters that yield little food. Hume adds that only on dull, cold, cloudy days has he seen them active during the noon hours.

Gait, Swimming, Diving. This Pochard is more of a land bird than the Common Pochard, is often found on the water's edge, and occasionally will even graze on land. Captive specimens show well the marked difference in this respect between this and other Pochards or Scaups. Many observers have noted the peculiarity of their attitude. The body is carried more horizontally than in other fuliguline ducks, and the bird walks not only with greater ease, but with less of a roll (Naumann, 1896–1905; Finn, 1915; Millais, 1913).

The swimming attitude is not particularly characteristic; the tail is carried low or dragging in the water.

Some of the older observers (Legge, 1880; Dresser, 1871–81) thought that this duck obtained all its food without diving. It is true that in confinement it takes on all the feeding habits of a true shoal-water duck, but in the wild state most of its food, at least in winter, is obtained by diving. It may perhaps be true that it is not able to remain so long under water as a Common Scaup and probably cannot feed at extreme depths. In many of their shallow feeding grounds diving is unnecessary. Poncins (1910), who made a close study of a breeding colony of these birds in northern France, describes their diving as smooth and easy, and without the preliminary forward toss of the head. He says their movements in diving are slow and supple. Under water the wings are used, but only slowly and intermittently. Their speed under water is rapid and they easily change their direction. One observer noticed what he thought was their inability to stay under water for more than a few seconds when feeding among Coots, but undoubtedly this was in shallow water where long dives were unnecessary. Millais (1913) estimates the extreme duration of a dive at thirty seconds. Both Hume and Marshall (1879) and Baker (1921) who had exceptional opportunities to observe large numbers, consider them active and agile divers, capable of supplying themselves with food at considerable depths.

Flight. They rise from the water with some effort, as do all diving ducks, but the flight is strong and rapid, producing a faint whistling sound. Hume and Marshall (1879) say they could generally distinguish this species from the Common Pochard by the "wing rustle," but that sometimes they were deceived. In Europe and the Mediterranean countries, where this duck is sporadic and rare, small flocks or even single birds are the rule, though in Provence large flocks have been seen (Aptel,

1915). On the great wintering areas of the East, the Caspian and India, they congregate in enormous numbers, the flocks sometimes totaling thousands (Hume and Marshall, 1879; Baker, 1921). Flocks composed only of adult males are occasionally seen (J. I. S. Whitaker, 1905; Hume and Marshall, 1879; Dalgliesh, 1903). In the colony studied by Poncins in France they always seemed to arrive on their breeding grounds in pairs.

Association with other Species. The Red-crested Pochards on their feeding grounds associate freely with other ducks and even with Coots, but when flushed tend to separate out into flocks of their own kind. Single specimens are commonly found alone, and seldom with flocks of other ducks (Naumann, 1896–1905).

Voice. The male's voice, which I have often heard from confined specimens in the spring, is very peculiar and not to be confused with that of any other diving duck. This noise, for such it is, may be roughly described as a loud, hard, rasping wheeze, extremely disagreeable and unmusical. It may be uttered several times, and during the display season the males are very noisy. Probably this call is seldom heard at other times of the year. Heinroth (1911) describes the male's note as a "snoring sneeze" and he says it may also be used as an expression of excitement, accompanied by a ruffling of the head crest.

The note of the female is not very distinctive, and like that of many other females of the diving ducks consists of a rattling, *churr-rurr*, used as a note of attraction during courtship and as an expression of fear. Heinroth (1911) mentions another call of the female, a rather soft *quak*, associated with anger.

The trachea of the male, figured by Yarrell (1827), may be considered as the type of many fuliguline tracheæ. The windpipe is nine inches long, narrow in diameter in the middle and toward the lower end, and with two enlarged areas which are not abrupt dilatations like the one in the Rosy-billed Duck (*Metopiana*). The tracheal bulb is large, inclining toward the left side, and distinguished from the bulb of surface-feeding ducks by its membranous windows supported by slender frames of bone.

Food. The food consists chiefly of vegetable matter, procured by diving, sometimes in shallow water by merely immersing the head or by tipping up in the manner of shoal-water ducks. Although no careful stomach analyses like those of our own U.S. Biological Survey are available, general observations made by Naumann (1896–1905), Hume and Marshall (1879) and Baker (1921) indicate that the vegetable food consists largely of tender roots, buds, shoots, tips of leaves, flowers and seeds of various water-plants, especially pond-weeds (*Potamogeton*), water milfoil (*Myriophyllum*) and water crowfoot (*Ceratophyllum*). In India they have even been found grazing on young crops and picking up shells and insects on the dry land. The

animal food is probably more important in summer than in winter. Hume and Marshall (1879) remark that they have found small frogs, fish-spawn, shells, insects, grubs, worms and sometimes even tiny fish in the stomachs. One male which they examined had gorged itself entirely on small fish about an inch in length, and another which Baker (1921) dissected in the Sunderbunds, was found to have fed entirely on "small red crabs."

Courtship and Nesting. The courtship is not a showy affair although the males are very noisy, uttering their sharp wheezing cries and elevating their splendid crests. At this time they are animated and exceedingly interesting to watch. Millais (1913) describes the males as throwing the fore part of the body from the water, depressing the bill upon the fore neck and at the same moment erecting and spreading all the beautiful feathers of the crest. The body seems never to be raised to a perpendicular position, and those I myself have watched hardly reared up at all; but it is seldom that one observer can get a clear picture of all the display attitudes.

It is not certain whether young birds breed the first year, as do the Common Pochards. Specimens reared in captivity seem to indicate that most if not all do not nest till the second year (Wormald, *in litt.*).

Information as to the spring-arrival dates is by no means voluminous. In some localities they appear on the breeding grounds early (March 17–25, in northern France), but they do not nest there before the end of April, or in May. Like other diving ducks they may be considered late nesters, although earlier than Scaups, Scoters and some others. In northern Algeria at the end of May and early June many of these ducks were not yet nesting (Zedlitz, 1914). In central Germany clutches were not complete before the middle of May (Baldamus, 1870). W. Eagle Clarke (1895) found several pairs nesting in the delta of the Rhone in the third week in April. In western Asia Poliakov (1916) found young birds as early as late May on the Irtysh River.

The nest is always placed on or close to the edge of the water, in thick reeds. One nest described in Naumann (1896–1905) as exceptional was sixteen to twenty steps from the water. It had the general appearance of a Coot's nest, bulky and roughly constructed of flags or rushes, lined with down. Islands seem to be favorite locations. W. Eagle Clarke (1895) describes one nest in Provence that was in the center of a dense mass of purslane six feet from the water and was reached by a covered lane two feet in length, worked through the scrub where it rested on the soil. The nest itself was placed on the ground, and consisted of a broad ring of down with a few short dry tamarisk twigs. The nest-down is grayish but larger, darker and more sooty than the Mallard's. It is said to resemble closely that of the Eider.

The normal clutch consists of six to ten eggs, the average being about eight. Clarke (1895) has reported a clutch numbering as many as seventeen, the work of

two females. Another nest found in the Rhone delta had fourteen eggs and was also laid in by two females (Ingram, London Field, Sept. 5, 1908). The eggs when fresh are of a clear pea-green to grayish-green color which fades to a grayish yellow after the egg is blown. The measurements of seventy eggs averaged 58.33 by 41.76 mm., the greatest length and breadth being 62.3 and 45.1, the smallest length and breadth 53 and 39.6 mm. (Hartert, 1920a).

According to St. Quintin (Millais, 1913) the incubation period is twenty-seven days; according to Heinroth (1908), twenty-eight days. Mr. Wormald's captive-laid eggs hatched in less time, twenty-five to twenty-six days. Male birds gather together soon after incubation has commenced and leave the vicinity of the nest, probably at times traveling considerable distances in order to moult. Poncins says that in the little colony he observed so closely the males mingled with the young when the latter had grown to full size.

The male begins to go into eclipse plumage at an early date.

Status. A general idea of the enormous numbers of this Pochard in Turkestan and India has been given in the account of its distribution. In western Europe the status seems to be about the same as it was fifty years ago, that is, scarce and irregular; but Millais (1913) remarks that hardly a winter now passes without a specimen being killed or reported somewhere in England. The species seems to have disappeared as a breeding bird in Saxony since the eighties (A. Müller, 1880), but in the delta region of France it appears to be holding its own, if not increasing. Baker (1921), the latest authority on Indian birds, makes no mention of any decrease in that part of the world.

Enemies. The enemies of the diving ducks do not differ essentially from those of surface-feeders and nothing specific is recorded for this species. The nest found by Mr. Ingram in the Rhone delta was deserted and partly destroyed and he suggests the Marsh Harrier as a possible culprit. Naumann (1896–1905) mentions various intestinal worms and parasitic feather-mites.

Food Value. Over most of its range this duck is considered very good for the table, but in India, where at times they take a good deal of animal food, they are, like the Common Pochard, under similar conditions, rank and coarse (Baker, 1921). When eating proper food they are fully as good as the Pochard or the Widgeon.

Hunt: Hume (Hume and Marshall, 1879) seems to have been the first to hunt these ducks with a punt-gun, and his description conveys a good picture of their behavior when approached by water. "We had had a very heavy and late rainy season, and this *jhil*, always large, was then immense. All night long, pitched as my

tent was on a masonry revetted terrace, rising immediately out of the water, I had heard fowl coming in; and the next morning, before dawn, I was out in my punt, working softly round the margin to the western side, so as to have the fowl, when twilight broke, against the daylight sky. I soon made out by their cries that the mass of the fowl were Pochards, that there were a vast number of them, and that a great number of them belonged to the present species. Day dawned, and I could soon see a dense mass of fowl, but far more distant than I expected, probably fully a quarter of a mile off, and much too far to make anything of, even with glasses, in the dim light and through the wavy curtains of almost impalpable mist that flickered above the water. Lying down I paddled towards them. Very soon a fresh northeast wind (and I was heading that way) sprang up against me; quite a sea rose; I was perpetually grounding (a few months later this whole side of the lake was one waving sea of wheat), and they were swimming away steadily against the wind, so that it was bright sunlight before I got within 200 yards, and then I could see that they were all Red-crests. I had now got into deeper water, and went as hard as I could manage without splashing, but they swam steadily away, and I must have gone fully half a mile before I had gained 100 yards on them. Still they had not shown the smallest signs of suspicion (and I knew their ways well), but were swimming gaily on *en masse*, head to wind as they often will on cold windy mornings. On I went; I had a long heavy English swivel, carrying a pound of shot (No. 1 I had in); there were between two and three thousand of them as closely packed as they could swim. I began to bet with myself that I should not get less than one hundred; never had I had quite such a chance, taking it all round; number of fowl, close packing, rumps all towards me, my best gun. I was certainly within seventy yards of the hindermost birds; I calculated to get within about forty yards of these and fire over their heads into the center of the flock. They were close packed and backs to me, so that there was little to gain, and possibly a great deal to lose by flushing them. I was within fifty yards when again I grounded; had I even then fired at once, I must have made a very large bag, but I thought I knew that this was only the point of a mound, (a tiny island in most years) and I wasted some precious moments struggling to get over it with the paddles. The nearest birds must have been seventy yards distant, before, seeing I was hard and fast, I snapped an ammunition cap on a little pistol I always carried for the purpose, and raked them as they rose. The next instant there was a whole line of birds fluttering on the water — seven dead, and twenty-one winged. I recovered every one of them, but it was noon before I bagged the last, and if I had had a desperate hard six hours' work, I hardly remember any six hours which I more thoroughly enjoyed; and that, although it was nearly a week before, with my raw hands, I could touch paddle or quant again."

In India they seem rarely to be captured in standing nets but are not uncommonly taken along with Gadwall and other ducks in fall-nets over baited ground. From

the sporting point of view these ducks leave little to be desired, since they are as shy and active as their cousins, the Common Pochards. A large flock of male Red-crests on the water must be a sight worth seeing. "One morning in December," says G. Reid (1881), "I came across countless numbers on a *jhil* in the Fyzabad district, closely packed, and covering nearly the whole surface of the water, with their red heads moving independently, while the breeze kept their crests in motion; a distant spectator might have mistaken them for a vast expanse of beautiful aquatic flowers."

Behavior in Captivity. None of the diving ducks is better suited for the ornamental pond than this. It is very attractive, moderately hardy, long-lived and easily tamed. All diving ducks have this advantage over the surface-feeders, that they spend much more time on the open water and so make a finer show on the pond. Besides these qualities the Red-crest nests rather freely in captivity, and the young, though not so easy to rear as those of the Mallard and other common ducks, respond well to expert care. They have been reared in so many zoölogical gardens and estates in England and on the Continent that it is not necessary to go into details. It seems not to have been kept in England before 1874, when Mr. E. C. Buck presented it to the London Gardens. In 1876 he forwarded twelve males and six females from India. These did not breed among themselves, but crossed with Rosy-bills (*Metopiana*). Later the species was frequently reared. At first the value was very high, up to £30, but later on it fell to £3 or £5 the pair (Hubbard, 1907). The present price for good hand-reared stock in England is £5 the pair. In this country before the War they used to sell for about $25.00 to $30.00 the pair.

In the Berlin Gardens many free-flying birds were kept and seldom left the vicinity. But one banded specimen reared in the spring of 1911, left in the autumn, and was taken on November 26, 1911, at Peronne in France (Heinroth, 1912a). In these Gardens, clutches were recognized by their being placed on rather flat cones on the top of which the mold for the nest was formed. This nest-form was adhered to even when the location was perfectly dry, and seems to be characteristic of the diving ducks, who elevate their nests rather than depress them, as the surface-feeders do. Some of the females, especially at the beginning of the breeding season, were very sensitive about human disturbance, and left the nest permanently if once driven away. Others were persistent sitters and paid little attention to human beings. The young have to be reared with specially prepared food, and on account of their weak legs they soon become worn out if allowed to follow a hen about (Heinroth, 1911). It was also noted that the wings of the ducklings grow very much later than those of the surface-feeding ducks. At Scampston, Yorkshire, Mr. St. Quintin's caretaker had little trouble in rearing the young. They proved to be early layers (April) and produced clutches of seven to nine eggs, which were deposited in bulky nests. The nests were hidden beneath thick bushes or dense undergrowth and incubation in one

instance lasted twenty-seven days. Out of a brood of five, hatched on May 26, a male began to be perceptibly different from the females while still a little under seven weeks old, by some indications of pink appearing near the base of the bill and by the feathers of the crown becoming darker and more erect (Millais, 1913).

Mr. Wormald told me that the earliest date of laying for his Red-crests at East Dereham in Norfolk, England, was April 17, which is rather earlier than one would expect.

The only available note on longevity is that of P. C. Mitchell (1911) who gives the average duration of life in twenty-four specimens kept in the London Gardens as three years and three months, the maximum being thirteen years. The maximum length of life in the Cairo Gardens was a little over five years (Flower, 1910) and it has never done well in the Calcutta Gardens (Sányál, 1892).

The only pair which I ever kept here in Massachusetts lived several years and seemed not to mind cold winter quarters.

Hybrids. Apparently the only wild hybrids recorded are the result of crossing with the White-eyed Duck (*Nyroca nyroca*) (J. H. Gurney, 1901). In captivity many curious combinations have been produced, of which the following is a partial list: Red-crested Pochard (*Netta rufina*) by Mallard (*Anas boschas*); by Australian Black Duck (*Anas superciliosa*); Indian Spot-bill (*Anas poecilorhyncha*); Pintail (*Anas acuta*); Rosy-bill (*Metopiana peposaca*); Widgeon (*Anas penelope*); Common Pochard (*Nyroca ferina*) (Poll, 1911); African Yellow-bill (*Anas undulata*) (Rogeron, 1903). Some of these crosses have been produced many times and recorded by various aviculturalists.

Hybrids with the Rosy-bill (*Metopiana peposaca*) are fertile, for one of them was successfully crossed with the Carolina Duck (*Lampronessa sponsa*) (Poll, 1911).

ROSY-BILLED DUCK

METOPIANA PEPOSACA (VIEILLOT)

(Plate 55)

SYNONYMY

Anas peposaca Vieillot, Nouv. Dictionnaire d. Sci. Nat., vol. 5, p. 132, 1818.

Anas metopias Pöppig, Froriep's Notizen, vol. 32, p. 9, 1829.

Anas albipennis Meyen, *ex* Lichtenstein MS., Nova Acta Acad. Leop.-Carol., Halle, vol. 16, suppl., p. 119, 1833.

Fuligula metopias G. R. Gray, List Birds British Mus., vol. 3, p. 143, 1844.

Fuligula albipennis Reichenbach, Synopsis Avium, Natatores, pl. 285, fig. 2350, 1850.

Anas pesosaca [sic] G. R. Gray, Genera Birds, vol. 3, p. 616, 1845.

Fuligula pesosaca [sic] G. R. Gray, Genera Birds, appendix, p. 28, 1849.

Metopiana peposaca Bonaparte, Comptes Rend. Acad. Sci. Paris, vol. 43, p. 649, 1856.

Fuligula peposaca Schlegel, Mus. Pays-Bas, Anseres, p. 31, 1866.

Metopias peposaca Heine and Reichenow, Nom. Mus. Heineanum, p. 347, 1890.

VERNACULAR NAMES

English: Rosy-billed Duck, Black Duck.

German: Peposaka Ente, Rotschnabel Ente.

French: Milouin en deuil, Canard à bec rose, Canard peposaca.

Spanish: Pato picazo, Pato negro, Pato sin cresta, Pato silvestre picazo, Pato picazo o cresta rosa, Marreçao, Jeco.

DESCRIPTION

ADULT MALE: Whole head and upper neck black, but on the sides of the head a dark purple gloss is superimposed. Mantle black, with a greenish tinge. Scapulars very dark greenish black minutely freckled with white. Back black, with fine grayish freckles; rump, upper tail-coverts and tail black. Breast jet black; abdomen and flanks finely vermiculated with black and white. Under tail-coverts white. Wing-coverts very dark greenish brown except at the carpal joint where there is a white patch. Secondaries white, except at their tips where there is a broad black band. Four outer primaries cream-colored on inner web and blackish on outer web, remainder white with black tips. Under wing-coverts white except the marginal ones which are blackish. Axillars nearly white.

Iris rich orange to reddish or red or even clear yellow, depending on the season (C. H. B. Grant, 1911; R. H. Beck field-notes; Princeton Patagonian Expedition; J. L. Peters' notes). Bill lilac, tip black, knob pale tomato-red, shading into lilac; point of the gape black (C. H. B. Grant, 1911). Legs and feet yellow to yellow-ochre or orange; webs dusky.

Wing 228–245 mm.; bill 61–66; tarsus 41–45.

ROSY-BILLED DUCK

Male Female

Adult Female: A plain brown-colored duck, much darker on the back. The top of the head is very dark brown which shades into lighter tones on the sides of the head and to white on chin and throat. Speculum white as in male, breast much darker than abdomen, under tail-coverts white.

Iris hazel. Bill bluish slate-color with the tip black. Legs and feet dull orange-yellow to grayish with the webs dusky.

Wing 220–240 mm.; bill 54–59; tarsus 41–44.

Male in First (Juvenal) Plumage: Apparently like the female but the lower parts brown, lacking the silvery-white appearance of the old female. Bill without pronounced knob. The young males appear to be in transition plumages in April or May, that is, at six or seven months of age, and show the adult black feathers mixed with the worn brown ones.

Male after the Breeding Season: I have seen no specimen which might be called a true eclipse plumage. The knob decreases in size.

Young in Down: Not examined.

DISTRIBUTION

The Rosy-bill is one of the common and characteristic ducks of the Argentine Republic, where it is found throughout the year. Its seasonal movements are very irregular and limited. Its range, however, is a restricted one, comprising only the northern half of the Argentine and the adjacent territory. Wace (1921) states that it has been recorded from the Falkland Islands by Bennett. So far as I know there is no definite record of its occurrence on the mainland south of the Rio Negro, except the specimens seen and taken by J. L. Peters near Huanuluan, Rio Negro Province, and at Neluan some sixty miles southeast. Wetmore (MS.) saw several early in December on the Rio Negro just below General Roca. Farther north, in the Province of Buenos Aires, is its real home, and there it is said to be the commonest duck and one of the most abundant birds, especially in the breeding season (P. L. Sclater and Hudson, 1889; A. H. Holland, 1892; Hartert and Venturi, 1909; C. H. B. Grant, 1911; D. Rodríguez, 1918; E. Gibson, 1920; Beck, MS.; Wetmore, MS.). C. H. C. Burmeister (1861) found the species common on the Rio Paraná, and C. S. Reed (1916) states that it is common about La Paz, Mendoza Province. Farther north and especially west it becomes a much rarer bird, though specimens have been taken in Cordoba (Frenzel, 1891), Rioja (Giacomelli, 1907), Tucuman (Lillo, 1902) and in the Chaco (Lynch-Arribálzaga, 1920).

As to its status in Chile very little is known beyond the fact that it is a resident (James, 1892) and is most common in the central parts (Quijada, 1910). Schalow (1898) has recorded a specimen taken near Concepcion and I doubt whether the range extends farther south than that.

There is no record of the Rosy-bill's occurrence in Bolivia, but it is found in Paraguay (H. von Ihering, 1904; Bertoni, 1913). Kerr (1901) states that he saw a few late in January in the Gran Chaco and was told by Mr. Pride that the species was more common several days' journey to the west. The U.S. National Museum also has specimens from Paraguay.

In Brazil this duck occurs only in the extreme southeast, Province of Rio Grande do Sul (H. and R. von Ihering, 1907), but in Uruguay it is abundant, especially during the freshets. A few may breed near Concepcion (Barrows, 1884), but the species has been recorded also from Montevideo, Canelones, Maldonado, Rocha, Cerro Largo and the Rio Negro (Aplin, 1894; Alvarez, 1913; Tremoleras, 1920; Wetmore, MS.).

Migration

Seasonal movements do occur and as little has been written about these I think it is worth while to quote from Mr. Peters' notes. He says: "Upon my arrival at 'Las Yngleses' (Mr. Gibson's old estate)

in Buenos Aires Province on May 8, 1920, I was told that for the last few months there had been very few ducks on account of the low water, the result of a protracted dry period. During the night of May 9, however, rain began to fall and continued for twenty-four hours, during which time over five inches fell. At about 3:30 on the afternoon of the 11th a flight of ducks appeared coming from the northwest (afterward thought to be nearly 75% *Metopianas*). It was not a steady flight, rather a succession of roughly V-shaped flocks of from thirty or forty up to one hundred or so individuals, sometimes passing two or three per minute, followed by an interval of five or ten minutes in which no flocks passed. This flight continued until dark and was still going by up to half-past nine the next morning. After this there were scattering flocks for a day or two." Most of these ducks appeared to be males. At the same time many Brown Pintails were flying and these also were all or nearly all male birds.

When he was collecting at Huanuluan, Rio Negro Province, Mr. Peters first noted Rosy-bills on September 13.

GENERAL HABITS

The Rosy-billed Duck may be thought of as distinct from the Pochards and Scaups, yet as having something in common with this group and perhaps also with the Red-crested Pochard. Its chief external peculiarity is the gorgeously colored and much swollen bill in the males. The trachea in this sex is supplied with a huge expanded chamber in its central portion, a character common also to the Velvet Scoter (*Œdemia fusca*) and in a lesser extent to the Harlequin Duck (*Histrionicus*).

This duck seems to prefer shoal water or pools in the marshes rather than the deeper water in which many of our more typical diving ducks feed. In this respect it resembles the Red-crested Pochard, only it is a more extreme case.

In the field the bill of the male makes a distinctive mark. In mixed collections of water-fowl females both on the wing and in the water resemble closely the females of Red-heads or Pochards, but the white under tail-coverts are easily distinguished. Mr. J. L. Peters writes me that the male is always easy to tell from any other duck. When at rest the glossy-black plumage and crimson swollen bill are sufficient, and when flying the same characters coupled with the white-tipped secondaries and white inner webs to the primaries as well as the large size make a mistake almost impossible. He describes the female as looking a good deal like a female Canvas-back.

Wariness. Wetmore (MS.) found that in Buenos Aires Province these birds showed "entire lack of fear of any object not wholly visible to them, so that to secure a shot it was often only necessary to crouch in the grass or rushes when the birds were circling on the wing." Nevertheless the Rosy-bill may be classed as a moderately wary bird, though like other diving ducks scarcely to be compared with the Widgeon or the Pintail.

Gait, Swimming, Diving. The gait is less awkward than that, for example, of the Scaups. Certainly a great deal of their food is obtained in shallow water or from floating vegetation and some collectors have never seen them dive; while in cap-

MAP 78. Distribution of Rosy-billed Duck (*Metopiana peposaca*)
Sporadic records indicated by crosses (×)

tivity they do not dive as freely as some of their relatives. Finn (1900, 1915) notes that they do not dive much in confinement and that when they do attempt it they show more of a "spring" in going under.

Flight. These ducks, being large heavy birds with short wings, are clumsy and slow in getting away, but once in the air the flight is swift and direct and often sustained for long distances. In the winter season they gather into considerable flocks wherever they are common. Flocks of ten to fifty were seen in Uruguay (Scott and Sharpe, 1912), and Sclater and Hudson (1889) speak of "very large flocks," while Daguerre (1920) says that in winter thousands may be seen together. Sclater and Hudson also state that Rosy-bills can perform long journeys traveling in extended lines at a considerable elevation. When Mr. J. L. Peters was at Las Yngleses, eastern Buenos Aires, in May, 1920, he was fortunate in seeing a great migration of these ducks. It began early in the afternoon of the 11th and continued until late the next morning, with a scattered flight for another day or two. The flocks were from thirty or forty up to one hundred and were mostly composed of male birds. He spoke of them as roughly V-shaped.

Association with other Species. E. Gibson (1920) mentions their flocking with Brown Pintails in the autumn, and of their supposed parasitic nesting habits there will be occasion to speak in connection with the breeding activities.

Voice. The voice of the male is not striking or loud. I have heard it from captive birds in the nesting season and find it described in my notes as a "little whining, mewing call, constantly uttered and certainly resembling that of the Common Pochard, which was calling at the same time." Wetmore (MS.) was fortunate enough to see the male courting in its native surroundings, and describes the note of the drake as "a purring *kah-h-h*, a low call that carried for only a short distance." Hudson (P. L. Sclater and Hudson, 1889) described the male's note as a "deep, hoarse, prolonged, raven-like note," but it seems most likely that he heard the female, which is said to have a loud quacking note like that of the Red-crested Pochard, but somewhat harder (Heinroth, 1911).

The remarkable trachea of the male is 220 mm. long and the central portion is greatly expanded, forming a roughly spherical pouch 30 mm. long and 25 mm. broad. A similar structure is found in the Velvet Scoter and the Harlequin. The osseous bulb at the bifurcation of the windpipe, faces to the left and forward and is very peculiar, although it is of the same general type as found in some other diving ducks. It has a shape somewhat like that of a lima bean with the outer rim greatly thickened and bony and the sides consisting of thin, transparent membrane. It is 20 mm. long and 16 mm. wide in its greatest dimensions. This remarkable organ was first figured by Garrod (1875).

Food. Field naturalists have noted that they feed on floating weeds in shallow or shoal water and never on dry land (P. L. Sclater and Hudson, 1889). Small roots, fishes, small insects and snails (*Ampullaria*) have been found in their crops (D. Rodríguez, 1918). Daguerre (1920) says he has seen them feeding on floating grains of corn on the inundated fields in winter. The stomach of a male bird collected by Mr. J. L. Peters at Huanuluan, Rio Negro, Argentina, in October and analyzed by the staff of the U. S. Biological Survey, contained 60% animal matter and 40% vegetable. The principal items were ground-up caddis larvæ and more than 450 seeds of water milfoil (*Myriophyllum*) besides seeds of rush and bits of rootstock of grass or sedge.

Courtship and Nesting. The courtship of this duck is not marked by any bizarre attitudes. The males I have watched threw their heads back quickly at the same time that they uttered their spring call. Dr. Wetmore (MS.), observing them in the field, speaks of four or five males pursuing one female, who remained in the lead. Every now and then one of her suitors rose to flutter along for four or five feet, with the rear portion of the body dragging on the surface of the water.

The nesting season extends from mid-October to December in the Province of Buenos Aires. In late September a series of thirteen males taken by R. H. Beck (MS.) at Mar del Plata showed enlarged organs, while out of nine females taken at the same time two had the ovaries large and the remainder "swelling." Eggs have been taken on December 9 (E. Gibson, 1920) and some were found in the body of a female as late as January 8 at Barracas al Sud (Hartert and Venturi, 1909). The month of November is the common nesting period.

For a number of years field collectors (A. H. Holland, 1892; C. H. B. Grant, 1911; D. Rodríguez, 1918; E. Gibson, 1920) have reported remarkable parasitic habits in the Rosy-bill. Eggs, supposedly of this species, were found in the nests of many other birds, especially the three coots (*Fulica armillata*, *F. leucopyga*, and *F. leucoptera*), both swans (*Cygnus nigricollis*, *Coscoroba candida*), the Southern Courlan (*Aramus scolopaceus*), the Spot-winged Gull (*Larus maculipennis*), Crested Screamer (*Chauna chavaria*) and even the Maguari Stork (*Euxenura maguari*). One of these observers (Rodríguez) goes so far as to say that in his opinion the Rosy-bill never builds its own nest. But he admits that these parasitic eggs are seldom hatched and that if they are, the ducklings soon die. The abundance of the species mystifies him, as he confesses.

Doubts have recently been cast on these observations by Daguerre (1920), supported by Dabbene (1921). The former, after a careful examination feels certain that the ducks' eggs found in the nest of Coots and other birds belong to the Black-headed Duck (*Heteronetta atricapilla*) and not to the present species. He even believes that the Rosy-bill itself is more or less parasitized by the Black-headed Duck, wherever they are found together.

There is no doubt that *Metopiana* builds its own nest and until further studies of its nesting habits are made we must assume that this is usually the case. It is better not to dogmatize on this point, since some of our northern diving ducks, particularly Red-heads, Canvas-backs, and Ruddy Ducks, lay more or less indiscriminately in each others' nests.

The nest of the Rosy-bill is a deep well-made structure built of dry flags, standing about six inches above the water or very near the edge (P. L. Sclater and Hudson, 1889; E. Gibson, 1920; Daguerre, 1920). In other words the nest is quite typical of true diving ducks, more carefully constructed than those of surface-feeding ducks. It is usually placed in reed-beds or dense masses of aquatic vegetation.

The clutch is large, numbering up to fourteen, the average perhaps ten. The eggs are variable in color, running from greenish gray to cream-color and measuring from 51–59 mm. in length and 40–45 mm. in breadth. They are said to resemble somewhat those of the Fulvous Tree Duck (*Dendrocygna bicolor*) (E. Gibson, 1920; Daguerre, 1920). The incubation period lasts from twenty-six to twenty-eight days (Heinroth, 1908; H. Wormald, *in litt.*).

Nothing is known of the care of the young or of the behavior of the male during or after the incubation period. E. Gibson (1920) mentions a female that was accompanied by no less than 52 young, but such congregations are not unusual with other species of water-fowl.

Status. Though no definite statistics as to the present status of this species have been published, we know that it was and still is one of the most abundant ducks in the center of its distribution; that is, the Province of Buenos Aires and in Uruguay. It is often found in the markets of Buenos Aires, according to D. Rodríguez (1918). Mr. J. L. Peters found it second only to the Brown Pintail although, of course, greatly exceeded by that ever-present species.

Food Value. From the point of view of both size and flavor the Rosy-bill is one of the best South American ducks.

Behavior in Captivity. The Rosy-bill is a desirable addition to any collection of water-fowl, both on account of the extraordinary color of its bill and because of the absence of an eclipse plumage in the male. Hand-reared strains breed readily, become tame, and get along well with other ducks.

The species was not kept by earlier aviculturalists either in England or on the Continent. The London Zoological Society obtained its first specimens in 1867. In 1870 three pairs were received and these bred in 1873, the young being hatched on July 20. The species has bred in the Gardens and in other European collections a number of times since. Miss Hubbard (1907) says that in 1876 twenty-seven cou-

ples arrived in England, which sold for £25 the pair, but that later the price fell to £4 10*s*. or £6. The present price is £4 10*s*. the pair. No doubt this was due to the creation of a hand-reared stock. In Mr. Wormald's (MS.) experience the earliest date of laying in England was April 19.

In American collections it has never been a common bird. Since the War only a few have been imported. The pre-War price was about $20 to $30 the pair, although the New York Gardens have obtained them for as little as $9.00 each. In America, so far as I know, only Mr. William Rockefeller has succeeded in breeding them, probably because the best of the hand-reared stock of water-fowl rarely reaches this side of the water.

The thirty-nine specimens in the London Gardens lived about four years on an average, the maximum being thirteen years and four months (P. C. Mitchell, 1911). Heinroth (1911) notes that the free-flying specimens in the Berlin Gardens disappeared very quickly, and that even birds which have been pinioned for years show a very restless temperament. Young birds on experimental flights usually ended up in the most incredible places. Some flew through glass roofs which they apparently took for water.

It is a great pity that the more attractive water-fowl of southern South America are so seldom landed on our shores. One reason is, of course, the poor steamer connections between Buenos Aires and New York. Then, too, stocks of geese and ducks which do reach this country seldom fall into careful hands and consequently we do not produce the fine hand-reared strains which are, or rather were, so common in Europe.

Hybrids. There are no records of wild hybrids, but in captivity this duck has been successfully crossed with the Red-crested Pochard (*Netta rufina*), the Common Pintail (*Anas acuta*) and the Carolina Duck (*Lampronessa sponsa*). The hybrids between Rosy-bill and the Red-crested Pochard proved fertile and were crossed with the Carolina Duck (Poll, 1911; J. Delacour, *in litt.*). According to Heinroth (1919) the male hybrids between *Metopiana peposaca* and *Netta rufina* regularly assume a summer plumage resembling that of the latter species.

Mr. Wormald has obtained hybrids from a mating, male Rosy-bill by female Mallard. I am told that Mr. Hubert Astley crossed the Rosy-bill with a common Tufted Duck.

CANVAS-BACK

NYROCA VALISINERIA (Wilson)

(Plates 56, 57, 59)

Synonymy

Anas valisineria Wilson, Amer. Ornithology, vol. 8, p. 103, pl. 70, fig. 5, 1814.
Anas vallisneriana Sabine, Appendix Franklin's Journ., p. 699, 1823.
Anas valisneria Vieillot, Encycl. Méthodique, vol. 1, p. 359, 1823.
Fuligula vallisneria Stephens, General Zool., vol. 12, pt. 2, p. 196, 1824.
Aythya valisneria Boie, Oken's Isis, p. 980, 1826.
Fuligula valisneria Hartlaub, Verzeichniss nat.-hist. Sammlung Ges. Mus., p. 120, 1844.
Nyroca valisneria G. R. Gray, List Birds British Mus., vol. 3, p. 43, 1844.
Aythyia erythrocephala Lichtenstein (*nec* Brehm), Nomenclator Avium, p. 102, 1854.
Æthyia valisneria Cabanis and Gundlach, Journ. f. Ornith., vol. 5, p. 229, 1857.
Aristonetta vallisneria Baird, Birds No. Amer., p. 793, 1858.
Æthyia vallisneria Dresser, Ibis, ser. 2, vol. 2, p. 43, 1866.
Fuligula valisneriana Audubon, Birds of Amer., vol. 6, p. 299, pl. 395, 1843.
Anas valisneriana Giebel, Thesaurus Ornith., vol. 1, p. 364, 1872.
Fulix vallisneria Coues, Key No. Amer. Birds, ed. 2, p. 703, 1884.
Nyroca vallisneria Salvadori, Cat. Birds British Mus., vol. 27, p. 342, 1895.
Marila valisineria A. O. U. Checklist, ed. 3, p. 74, 1910.
Aristonetta valisineria Oberholser, Auk, vol. 36, p. 267, 1919.

Vernacular Names

English: Canvas-back, White-back, Sheldrake, Can, Red-head, Red-neck, Bull-neck, Red-headed Bull-neck.
German: Kanevasente.
French: Milouin aux yeux rouges, Canard cheval.
Mexican: Coacostle, Coacoxtli.

DESCRIPTION

Adult Male: Somewhat similar in coloring to the male of the Red-head (*Nyroca americana*) but larger, lighter-colored on the scapulars, and with a much longer bill. Top of head, fore part of face and chin nearly black, but remainder of head and the neck bright rufous chestnut. Scapulars in fully plumaged old males nearly white, with very fine vermiculations. Rump black, tail brownish to black. Breast jet black, sharply defined from the pure white of the upper abdomen. Lower abdomen slightly vermiculated with gray and under tail-coverts black, somewhat mixed with gray. Wing-coverts gray and vermiculated, but darker than the scapulars. Speculum slaty gray, lighter and vermiculated at the posterior margin; primaries dark brown.

Iris bright carmine, brighter in breeding season. Bill black or "greenish-black." Legs and feet gray-blue to dirty gray or yellowish gray.

Wing 225–242 mm.; tarsus 43–45; bill 55–63.

Weight 2 pounds, 8 ounces to 3 pounds, 12 ounces (1.13–1.70 kilograms); average of good birds about 3 pounds. There are numerous reports of couples, male and female, which weighed from 7 to nearly 8 pounds. Quite ridiculous are weights of 5 to 6 pounds each given by one writer.

Adult Female: Like the female of the European Pochard in coloring but not so dark on the occiput. Bill much longer and of a different shape.

Iris brown. Bill black as in the male. Legs and feet nearly as in the male.

Wing 220–230 mm.; tarsus 42–44; bill 54–60.

Weight 2 pounds, 12 ounces to probably over 3 pounds (1.36+ kilograms).

Female in First Plumage: Very similar to the adult, but may be distinguished by the browner and more mottled appearance of the whole abdomen as well as by the worn and blunted tail-feathers. The vermiculated feathers which give a silvery cast to the interscapular region in the adult plumage are not so well developed.

Male in First Plumage: The young male is easily distinguished from the young female by the much darker occiput and throat and by a black-streaked appearance of the face and neck which is apparent before the red of the adult plumage comes in. Sometimes nearly the whole head and neck are black. The rest of the plumage is very much like that of the young female, but vermiculated scapulars appear earlier and are lighter in color. The abdomen is brownish, or mottled brown and gray like that of the female, and the tail-feathers have the blunted appearance of youth.

Immature Male: Black feathers begin to appear around the lower neck and upper breast by October or November, and by that time the head has become red, although not so rich in tone as it will be later on. The scapulars and flanks have also become much lighter, but the abdomen still remains brownish and mottled. Complete plumage is certainly not attained the first spring, and signs of immaturity may be found in the black of the mantle and the breast, particularly at the junction of the latter with the white abdomen.

Male in Eclipse: Captive specimens show a very imperfect change, as these birds are seldom vigorous enough to moult normally. But this is not a criterion of what happens in the wild. The first change, which I have noted myself, is a browner tinge coming in on the fore part of the head, which loses its red color. At the same time dark gray feathers come in on the scapular and back regions. The eclipse is not so striking as it is in most northern ducks and does not commence until late in the season.

Young in Down: Very much like the young of the Red-head (*Nyroca americana*) and perhaps not to be distinguished except by the heavier, longer and darker-colored bill. The bill is bluish colored, or grayish olive, fleshy on the lower mandible and with the gular sac pale brownish yellow. The feet are olive or greenish olive, dusky on the digital joints and webs. The body-coloring appears to be the same as in the Red-head and European Pochard but may not have quite such a pronounced yellowish tinge. The yellow, however, fades out after the first few days and is a deceptive character.

Remarks: Deeply stained under parts are common in many adult specimens. Especially is this true in those from the Mississippi Delta.

CANVAS-BACK
Female Male

COMMON POCHARD
Female Male

RED-HEAD
Female Male

DISTRIBUTION

Breeding Range

The Canvas-back, perhaps our best-known American duck, has a distribution very similar to that of its relative, the Red-head, though more extended both to the north and to the south. There is one record of a specimen having been taken on May 18, 1917, on St. George Island in the Pribilov group (G. D. Hanna, 1920) and Dall and Bannister (1869) state that they found the Canvas-back breeding in some numbers at Fort Yukon(?). Specimens have been taken at Juneau and Sitka, and in the interior the species has been reported as nesting in some numbers near Fort Anderson, 68° 30′ north latitude (R. MacFarlane, 1908)! It is of irregular occurrence in the basin of the MacKenzie (*ibid.*) but has been taken at Fort Simpson, Fort Rae, Fort Providence and Fort Resolution on Great Slave Lake (U.S. Biological Survey; R. MacFarlane, 1908). Everywhere in the region south of Great Slave Lake it is common (Preble, 1908). It is probably a nesting bird in suitable localities throughout British Columbia, south to Lumby and Grand Forks; in the Cariboo region it is a common breeder (A. Brooks, 1903, 1920). Northern Alberta is, perhaps, the center of abundance in the breeding season. On the Lesser Slave Lake and Peace River it is abundant (Preble, 1908; J. and J. M. Macoun, 1909) and the same is true of the delta of the Athabasca and the western end of Lake Athabasca (R. MacFarlane, 1908; Seton, 1911; Harper, MS.) though specimens have been seen on Otherside River at the east end of the lake too (Harper, MS.). In central Alberta it appears to be less numerous (Stansell, 1909) though it nests in tolerable numbers about Edmonton (Preble, 1908; Spreadborough, *fide* J. and J. M. Macoun, 1909; Soper, 1918; A. Wolfe, *in litt.*), and at Buffalo Lake (C. B. Horsbrugh, 1915). In eastern Alberta, W. S. Brooks and Cobb (1911) found it a rather common breeder. Our information as to its status in Saskatchewan is very meager. Raine (1892) and Bent (1907) found it a common nester at Crane Lake, in the southwest, and Ferry (1910) states that it breeds abundantly at Prince Albert and Quill Lake in the central part. R. MacFarlane (1908) reports nests taken at Moose Lake in the Cumberland region. In Manitoba the breeding range seems to include only the western part and even there the species does not appear ever to have been abundant (E. E. Thompson, 1891). At present its numbers are undoubtedly reduced, but a few are still occasionally seen in spring at Shoal Lake (Taverner, 1919). Preble (1902) saw the species in summer at the mouth of the Saskatchewan.

Pribilovs

Alaska

Northern Canada

British Columbia

Alberta

Saskatchewan

Manitoba

In the United States the breeding range is very limited and is restricted to the western parts. I find no definite evidence of its nesting in Washington or in California, though W. L. Dawson and Bowles (1909) state that it nests rarely on the east side of the Cascades and A. H. Clark (1910) found it common in May near Port Townsend, Puget Sound, though these birds doubtless were migrants. According to Bendire (1877) it is a common breeding bird about Bear Creek in the Blue Mountains, Oregon, and Woodcock (1902) reports it nesting near Haines in the same State. A. A. Saunders (1921) gives breeding records for Malta, Yellowstone and Stillwater, Montana, but there is as yet no record of its nesting in either Idaho or Wyoming. It has been known to breed at Pyramid Lake, Nevada (Cooke, 1906) and is not uncommon in Humboldt County in May and June (W. C. Hanna, 1904). It has also been recorded as nesting in Utah (U.S. Biological Survey), and is known to nest sparingly about Barr Lake, Colorado (Felger, 1909; L. J. Hersey and Rockwell, 1909). Wetmore (1920) saw specimens at Lake Burford, New Mexico, in the breeding season and thinks that they undoubtedly nest there, while Nordhoff (1922), who is of the opinion that some numbers nest in the mountain lakes, states that he saw them nesting in Colfax County, New Mexico! McCauley (1877) met with specimens in the Red River canyon, western Texas, on May 24, and Villada (1891–92) asserts that the species is resident in the Valle de Mexico, but a few non-breeding ducks may often be found in summer in very distant wintering grounds.

United States

Pacific States

Montana

Nevada

Utah

Colorado

New Mexico

Texas

Farther northward again the Canvas-back is known to have nested at Cody, Irwin and Hackberry Lake, Nebraska (Cooke, 1906), and was seen in some numbers in the sandhill region during the nesting season (Oberholser, 1920). It is a fairly common breeding bird in Sanborn County, South Dakota (Visher, 1913) and has been found nesting in many parts of North Dakota (Job, 1899; Bent, 1901–02). Cooke (1906) gives Heron Lake and Madison as localities in Minnesota where nests have been found, but Roberts (1919) states that it is now practically extinct as a breeding bird in that State. Females and young have thrice been seen on Lake Kushkonong, Wisconsin, but these were probably crippled birds (Kumlien and Hollister, 1903).

Nebraska
Dakotas
Minnesota
Wisconsin

Winter Range

In winter the Canvas-back is found from southern British Columbia (A. Brooks; Kermode, 1904; Spreadborough, *fide* J. and J. M. Macoun, 1909) south along the coast and interior water-ways of Washington, where it is common (Edson, 1908; W. L. Dawson and Bowles, 1909; Rathbun, 1915), and Oregon (Woodcock, 1902; Jewett, 1914) and throughout California (Grinnell, Bryant and Storer, 1918; and others). In the Pacific it has been taken on Clipperton Island (Beck, 1907), Hawaii (R. C. L. Perkins, 1903), and even on the Marshall Islands (Reichenow, 1901)! In the interior some birds occasionally stay at Flathead Lake, Montana, till late January (A. A. Saunders, 1921) and others have been seen in Nevada during the winter (*fide* Hoffman, 1881). A few pass the cold season in northern Colorado (Felger, 1909) and others have been seen in Arizona (Coues, 1892; Scott, 1886) and in New Mexico (Leopold, 1921). In parts of Texas, such as at Lake Surprise (McAtee, U.S. Biological Survey), it is abundant, and in other parts, such as San Antonio (Griscom, 1920), Tom Green and Concho Counties, it is tolerably common (Strecker, 1912). McAtee (U.S. Biological Survey) found it very abundant in the Mississippi Delta, but Beyer, Allison and Kopman (1907) state that it is only locally common in Louisiana. This may be true, but great numbers winter there. Only a few pass the winter in Arkansas (Easton, U.S. Biological Survey; Howell, 1911), Kentucky (Pindar, 1889) and southern Illinois (Cooke, 1906), though it has been seen in some numbers about the St. Clair Flats and on both sides of Lakes Erie and Ontario (Wood, 1910; Swales and Taverner, 1907; Fleming, 1901). Some stay in the New York lakes during the cold season (Eaton, 1910; and others), and B. H. Warren (1890) says it may be occasionally seen on the Susquehanna.

Pacific Coast
Islands
Montana
Nevada
Colorado
Arizona
New Mexico
Texas
Louisiana
Mississippi Valley
Great Lakes

On the Atlantic seaboard it does not usually winter north of Delaware (Rhoads and Pennock, 1905) and Maryland (Kirkwood, 1895). It is common on the Potomac River, on the upper Chesapeake and on the James River, but in North Carolina it is confined chiefly to Currituck Sound, its present wintering stronghold in the East. Wayne (1910) states that it is abundant on the Santee and Savannah Rivers in South Carolina, but this is, I think, an overstatement. Farther south it becomes rare. In severe winters it has been taken at various points in Florida such as the lower St. John's River, Kissimmee, Lake Jessup, Merritt's Isle, Pinnellas and in Leon County (Harper, McAtee, U.S. Biological Survey; R. W. Williams, 1904; Pangburn, 1919). A few have also been taken in Alabama (Golsan and Holt, 1914), and it has been reported from as far south as Royal Palm Hammock in extreme southern Florida (U.S. Biological Survey records).

Atlantic Coast

In the Atlantic the Canvas-back has strayed to the Bermudas (J. M. Jones, 1859), Cuba (Gundlach, 1875) and Jamaica (March, 1864; P. L. Sclater, 1910).

Islands

The range in Mexico is not very well determined. On the Atlantic seaboard it occurs as far as Tampico (Sanford, Bishop and Van Dyke, 1903) and in the interior it is found in the Valle de Mexico (Herrera, 1888, 1890; Villada, 1891–92). Beebe (1905) saw four at Lake Chapala, and Grayson found it not uncommon at Mazatlan. According to Nordhoff (1922) some

Mexico

MAP 79. Distribution of Canvas-back (*Nyroca valisineria*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

winter on the lakes of the San Pedro Martir Mountains, though it is not seen on the coasts of Lower California. The southernmost record is that of specimens taken at Dueñas (Salvin and Godman, 1897–1904) and at Swan Isle, Guatemala (U.S. Biological Survey). Guatemala

Migration

The migration area and dates for the Canvas-back are so similar to those of the Red-head that great detail would be superfluous. Suffice it to say that in the northwestern States the species is known chiefly as a bird of passage. In the autumn many migrate eastward along the Great Lakes, though they do not go so far east as does the Red-head. It is or used to be a much rarer bird than the latter even in Ontario, while in the New England States and in the Maritime Provinces it can hardly be considered as anything but accidental. The spring migration probably follows the Mississippi Valley more than the Great Lakes route.

The data as to the migration are far too meager to permit of any conclusions. Representative dates, such as those given by Cooke (1906), are misleading in so far as they give rise to the impression that the flocks pass north or south *en masse*. This is not the case, for the migration is on the whole spasmodic and so dependent on local weather conditions that only great numbers of dates would permit of general conclusions. The fact that Canvas-backs appear in the northern States at the time when others are still in Mexico or Texas and that in autumn many are in their winter homes in the South before others begin to appear on the North Pacific coast gives some idea of how difficult it is to work out a logical account of the seasonal movements. In view of the inadequacy of our knowledge one can only give a few dates as a foundation for further detailed work. In spring many Canvas-backs leave the Gulf Coast in February and some appear in Kansas, Missouri, and Indiana by the end of that month. But the bulk pass the north-central States during March or the first half of April and do not reach the southern parts of Canada till the second half of April. On Lake Athabasca in 1920 they did not appear before May 12. On the Pacific Coast they leave California in March and April, and pass over Puget Sound in the latter month. Sanford (Sanford, Bishop and Van Dyke, 1903) mentions seeing some as far south as Tampico in late April.

The females and young are the first to start south in the autumn. Some regions seem to attract the birds of a different age (and sex?). Leopold (1921) noticed that all the Canvas-backs in the Albuquerque region of New Mexico were small and immature, while those from Lake Burford were large and fully feathered even early in the season. There seems to be a great excess of males among those Canvas-backs that winter on the lakes of central New York, as many as four or six males to one female.

In the autumn some of the Canvas-backs pass south into the United States as early as late September, but the great mass appear in our northern States during mid-October, sometimes delayed until the last of the month, and reach their wintering quarters on the Atlantic seaboard toward the end of the same month or the beginning of November. They keep increasing in numbers until December. In Mexico they hardly appear before November, while on the Pacific Coast the great bulk comes in during November and December.

GENERAL HABITS

The Canvas-back is our most famous duck and on the whole deserves its reputation, if for nothing else than because it has won out in a terrific contest with man and his most artful devices. This ought to be fame enough for any one bird.

Not content with leaving it among its relatives, recent writers have complimented this duck by giving it generic rank, forgetting, I think, that a genus is meant to convey the idea of relationships, just as much as it is to accentuate differences. In fact, one

might go farther and say that a genus ought to include a group of diverse creatures that nevertheless have a certain community of relationship; it ought to express relationship and likeness within a defined limit. If we make a separate genus for the Canvas-back we must do likewise for a great number of other ducks, and the end result would be absurd. Our duck is so evidently a Pochard in color-plan, habits, voice, display-attitude and the characteristics of its downy young that it seems reasonable to leave it where it has always been.

It is really rather difficult to confuse this with any other duck, particularly if one can get a profile view of the head, which even at a great distance is exceedingly characteristic. The French name *Canard cheval* is the most descriptive. On the wing it is more of a problem. Many people confuse the Canvas-back with the Red-head for no very good reason. I have even seen our Goosander passed as a Canvas-back by country boys in New England, and people who ought to know better have bought Red-breasted Mergansers, thinking they had a bargain in Canvas-backs.

The general nature of the waters frequented by this duck is a good deal like that where Red-heads are found, only the Canvas gets along in greater depths. It is more of a digger of roots. Likewise it is a hardier bird all around, cares nothing about cold as long as it can keep an open hole to feed in, and migrates later than its more delicate cousin. It is even more strictly a fresh-water duck than the Red-head and does not usually go to salt water unless really hard put to it to find food. There are a great many places in Pamlico Sound, North Carolina, which are excellent Red-head and Scaup ground (half-salt to wholly salt water, depending on winds and tide), where the Canvas-back never goes unless the food fails farther north. The same is true of the salt waters of Chesapeake Bay.

So much has been said about this bird that nothing short of a monograph could do it justice. Every book that has been written about American water-birds or American duck-shooting devotes a great deal of space to the Canvas-back and it is often referred to as the "King of Ducks."

Wariness. When in large flocks the Canvas-back is exceedingly hard to approach. Most of the early writers describe them as wary, cautious and extremely shy. When the young birds first arrive from the north at such points as the shore of Lake Erie they decoy readily if the weather conditions are right, and seem just as "foolish" as the Red-heads. But after they have been harassed for a month or two in the battery or bush-blind infested regions of the Chesapeake or Currituck they acquire a certain wisdom and may then be called "battery-shy." Toward the end of the shooting season, that is, just before they leave in early March, they become almost impossible to decoy. They gather in huge rafts and seem to be able to tell the position of a battery, rising high enough from the water to detect the ruse and sheering off to one side or the other as they come up; or more often they pay no attention

to the great flocks of wooden decoys and simply go boring along on their appointed road. There come days at any season when Canvas and Red-heads will not stool to decoys; why, nobody seems able to explain.

To sum up, I cannot agree with many of the older accounts which describe this duck as so extremely wild, for it is not wild when compared to our wintering New England Black Ducks for instance.

In hard, freezing weather accompanied by strong wind, Canvas forget their fear of points of marsh and let the wind drive them against these places in their flight, so that enormous bags may occasionally be made.

In common with the Red-head and other diving ducks, the Canvas-back is possessed of a strong sense of curiosity, which in the old days was taken advantage of on the waters of the upper Chesapeake. Large flocks were worked in toward the shore by means of a tolling dog and even by waving a red flag, but this method was long since abandoned. On their breeding grounds both C. B. Horsbrugh (1915) and Harper (MS.) found them very inquisitive and easily enticed by movements of a partially concealed observer, waving a hand to and fro. You can often attract them to a battery by kicking a foot in the air.

Daily Movements. Canvas-backs are active during the early morning and late afternoon on their autumn and wintering grounds. When much disturbed during the day they are one of the first of the wild-fowl to leave for the sea, getting up high in the air and bedding beyond the breakers in places like Currituck. They can stand a very choppy sea and consequently nowadays large shoots at Canvas-backs are only to be had in such places in very rough weather when they cannot stay on the ocean. Like the Red-head and the Pochard this species will feed at night, particularly on bright nights. But all diving ducks should have some period of the day to feed in, even if only a half-hour in the morning and another in the evening. Night shooting should, of course, be wholly prohibited, and the best results are obtained where there are several rest days every week or where the shooting stops every day by noon.

Posture, Diving. One of the finest sights in the water-fowl world is a great flock of male Canvas-backs on the water, with their upright richly colored necks and heads and gleaming white backs, which make them appear to sit very lightly on the surface. At other times they swim low, like a Pochard, the tail dragging in the water and only the curve of the back, neck and head showing above the surface.

They feed in water of moderate depth, from two or three up to eight or ten feet, possibly more at times. They are often found in deeper waters than those frequented by the Red-head, but it is very questionable whether they can feed at 25 feet as held by some writers. Although the habit of using the wings under water is commonly

seen in crippled birds, I doubt whether they are ever so used under normal conditions, except perhaps in the splashing dives seen during play.

The length of the ordinary dive is not very great, depending, of course, on the depth of the water. Mr. F. S. Harper (MS.) timed some on the Athabasca delta and found that they varied from 13 to 19 seconds under water. Thirty seconds is probably the limit, although I have no figures to substantiate this statement.

Flight. The flight is rapid, perhaps exceeding in speed that of the Red-head and other diving ducks, but estimates placing it at 100 miles an hour must be greatly modified. Recent careful speed measurements by British Army aviation officers place the ordinary speed of migrating ducks at not more than 45 miles per hour. Very likely diving ducks have a more rapid flight than most surface-feeders, but 50 to 55 miles per hour is certainly a generous estimate.

Canvas-backs give the impression of great speed when passing decoys. Often they do not check their flight in the least, but go by at a terrific pace, causing the best shots to shoot behind by many yards, while the left barrel goes unemptied. They migrate in large flocks and on the wing with the sunlight glancing from their white backs and ruddy heads present a splendid spectacle. Although the flocks maintain the same formation as the Red-heads, the birds themselves look much longer and more arrow-like in the air, and they fly more steadily, with less shifting about within the flock. They are usually entirely silent in flight, but the wings of a large company produce a loud, swishing noise, audible at a great height on a clear morning. When going to sea or changing their feeding grounds they get up to a great elevation where they thin out into long wavy lines or blunt angle-shaped flocks. They are very restless and do much "trading about," even when in their permanent winter quarters. Nobody can be sure where their lordships will plan to spend the day or night and they often leave a favorite region for several days, only to return as suddenly.

Association with other Species. The few straggling specimens which occasionally visit our New England ponds are almost invariably alone or in small groups of two or three. They never appear mixed with Lesser Scaup like the Red-heads. On the coastal waters of Virginia and North Carolina Canvas-backs feed with Swans, Geese, Widgeon and Red-heads and at times one may see huge rafts mingled with great swarms of American Coots. When any of these immense congregations of water-fowl takes wing the Canvas-backs soon separate out into flocks of their own. I do not remember ever seeing them mix much with Red-heads in the South.

Many of the diving ducks are rather closely associated on the nesting-grounds. The rush-beds which the Canvas-back selects are often occupied by Red-heads, Scaups and Ruddy Ducks. The nests are frequently very close together and mixed

clutches are far from exceptional. The Red-head is especially prone to mingle its eggs with those of the present species.

Voice. The male's voice is very rarely heard. Birds which I kept did not, during the whole spring, make any sound that I could hear, but Mr. Ned Hollister writes me that in the Washington Gardens he has heard males, during display, utter a "low, wheezing call." Males observed by Wetmore (1920) at Lake Burford, New Mexico, and those which Harper (MS.) studied on the Athabasca delta were entirely silent. Even when actively courting the females, they uttered no sound that could be heard at any considerable distance. But it is evident from Dr. Arthur A. Allen's (Bent, 1923) close study of confined birds that there is a perfectly definite courtship note which he heard distinctly at twenty or thirty feet. This he describes as a tri-syllabic *ick, ick, cooo* with a little interval between the second and third sounds. When the first two syllables are being produced the bird opens his bill slightly and then with considerable force appears to inhale quickly, jerking his bill as he does so. "It appears as though this sudden inhalation abruptly closes the glottis so as to produce the two rather high-pitched, sharp, quick, *ick ick* notes." He then goes on to describe the swelling of the back of the neck and the accompanying low *cooo* sound. He also saw the curious swelling which appears under the chin as the note is given. Indeed, this lump under the chin is so prominent that I have seen it on birds a good distance off.

One occasionally hears the female call on the wintering grounds. Her note is a coarse, guttural "churring" noise, usually represented by *kurr-kurr-kurr*, and greatly resembling the call of the female Red-head and the Common Pochard. The females are noisier in the spring and like other ducks will continually call when they are accompanied by the young. At such times a note more nearly resembling a quack has been heard by some observers.

The trachea of the male is ten inches in length, gradually tapering toward the lower end, but having a distinct enlargement one inch in length about three inches from the upper end. The lower end terminates in a left-sided dilatation which consists of an irregular flattened box, covered with membrane and very similar to the same structure in the Red-head and the Pochard.

Food. The favorite although not necessary autumn and winter food of the Canvas-back is the so-called wild celery (*Vallisneria spiralis*) from which the species has its name. This plant is so intimately associated with the duck that a short description of it may not be out of place. McAtee (1911) describes it as a wholly submerged plant with long flexible ribbon-like leaves of light translucent green color and of practically the same width throughout the whole length. The leaves vary from one-quarter to three-quarters of an inch in width. A leaf held up to the light displays

numerous straight parallel, lengthwise veins; besides these there are one median and two prominent lateral veins, connected at intervals by irregular cross-veinlets. It looks somewhat like *Zostera* or eel-grass, but differs by having the leaves grow in bundles from the root-stalks while those of the eel-grass arise singly and alternate on opposite sides of the stem. Pipe-wort (*Eriocaulon*) has ribbon-like leaves but may be recognized by its reticulation into small cells of uniform size. At certain stages the arrow-heads (*Sagittaria*) are difficult to tell from wild celery, although they usually have the end of the leaf expanded into a proper leaf-blade, or else quite pointed, neither of which characteristics is found in *Vallisneria*. The seed-pod of the wild celery, into which the pollenized flower develops, is three to six inches long, and is attached to the plant by a long slender twisted stem. The pods contain about fifty seeds to the inch and these fall off and become embedded in the mud. This plant has an irregular distribution, from Minnesota through the Great Lakes region to Nova Scotia, and from eastern Kansas and eastern Texas to the Atlantic coast. It is poorly represented all over New England. It can be transplanted either by the seed-pods, by the so-called winter buds, or by moving the plant itself. It grows best on rather firm muddy bottom in three and a half to six and a half feet of water and is seldom found in thick beds unless there is a slow current. Occasionally I have seen it growing on coarse sand with scarcely any admixture of mud. It never seems to attain its greatest luxuriance in an ordinary inland pond where the water is not moving.

About one-quarter of the food of the Canvas-back is said to consist of *Vallisneria* and it is usually maintained that the quality of the flesh depends entirely on this plant. Certainly the finest birds come from regions where wild celery is most common. Canvas-backs feed especially on the root-stalks and winter buds, while other species are content with the leaves and stems.

The most important studies of the food habits of the Canvas-back are still unpublished, but through the kindness of Dr. E. W. Nelson of our Biological Survey I am able to summarize the results. The stomachs used in the analysis numbered 381 and were collected during winter and early spring mostly in our southern States. Triumph (Louisiana), Lake Surprise (Texas), Marquette (Wisconsin), and the Mississippi Delta contributed most of them. Taking the series as a whole, vegetable food formed 84.8%, and this will be mentioned in a little more detail presently. But it must not be forgotten that each locality represented furnished a special food so that the final averages are not true for the winter range as a whole. For instance, 103 out of 113 birds from Triumph, Louisiana, fed very largely on the tubers of delta duck-potato which averaged over 66% of their food. Ninety-five of these 113 birds had taken a small snail (*Neritina*) to the extent of 19.43% of their diet. The banana water-lily was the most important December food from Lake Surprise for it comprised over 76% of the whole.

The vegetable food of the entire series was divided as follows: water-lily family 19.49% including the banana water-lily and the sweet-scented water-lily (*Castalia odorata*). The pond-weeds came next in order of abundance and made up 17.85% of all the food. The sago pond-weed (*Potamogeton pectinatus*) found in 189 gizzards proves this a very important item. One gizzard and crop contained 59 tubers, another 57 and a third 52, while seeds were also taken in very large numbers.

The arrow-head family, of which the delta duck-potato (*Sagittaria platyphylla*) was the favorite, composed 15.7%. The frogbit family was taken to the extent of 10.8% and wild celery was the only member of this family, being present in forty stomachs. The fact that so few stomachs contained this famous duck food may be explained on the basis of the localities where the ducks were shot.

Grasses, including wild rice and wild millet, formed 11.49%, sedges 2.94% and algæ, water milfoil, smart-weeds and other families in small amounts.

The animal food, 15.15%, is larger than one would expect, but this is accounted for by the abundance of a small snail in the stomachs from Louisiana, while ten other species of snails were identified. Insects were, of course, present in small numbers (1.46%) while accidental food such as scales and bones of fishes, a rat tooth and the teeth of musk-rats were present in a few stomachs.

Hollister (Kumlien and Hollister, 1903) remarks that the so-called celery buds which he took from the crop of a Canvas-back in Wisconsin, and planted, turned out to be not *Vallisneria* but one of the pond-weeds. The gemmæ of this weed comprise the greater part of the food in October and November on Lake Kushkonong.

When frozen out of its usual feeding grounds the Canvas-back will live for a time on *Zostera* and on crustaceans.

In California, where there is no *Vallisneria*, the Canvas-back gets more animal food than in the East, partaking extensively of crustaceans and shell-fish and acquiring a fishy flavor. Stomachs from San Pablo Bay, California, contained clams (*Mya arenaria*) and snails. One from near San Diego contained periwinkles (*Cerithidea californica*); another from the same place contained grass blades, stems and roots (Grinnell, Bryant and Storer, 1918).

Some unusual foods have been noticed by Audubon, who lists fishes, tadpoles, water-lilies, leeches, snails, and mollusks among the foods found in their stomachs. I hesitate to mention the disgusting habit to which this "king" of all the duck tribe sometimes resorts. Together with other water-fowl it occasionally gorges itself on decayed salmon in the bays of British Columbia and Washington (W. L. Dawson and Bowles, 1909). Wilson mentions their swarming about a wrecked ship which had been loaded with wheat, at Egg Harbor, New Jersey. I was told a similar tale about a wheat vessel which was wrecked on the beach at Long Point, Lake Erie, where a good many of these ducks actually spent the winter living almost entirely on the wheat. A stomach from California was found filled with barley (Grinnell, Bryant and Storer, 1918).

Unfortunately the feeding grounds of these ducks are easily destroyed by heavy ice which freezes down to the mud and sometimes results in the tearing away of all the surface vegetation. Much more serious are the floods which have become common in recent years on the rivers of the Chesapeake and which, bringing down great masses of silt, have from time to time destroyed some of the finest waters. The German carp, which unluckily has found a new home in the shallower parts of some of the Great Lakes and the fresher parts of the sounds of Virginia and the Carolinas, destroys great quantities of vegetation. Fortunately our foreign population has no objection to eating carp, and these coarse fish now find such a ready market in our large cities that their numbers may perhaps be kept within reasonable limits.

Courtship and Nesting. Evidently the full display of this species (see Plate 57) is only occasionally carried out. I have never seen it in the captive pairs which I carefully watched throughout the whole spring. Apparently neither Wetmore (1920) nor Harper (MS.) ever saw it in the field. Nevertheless, the birds do at times go through the throw-back movement characteristic of the Pochard, Red-head, and Golden-eye, for Mr. N. Hollister (*in litt.*) noted it on January 28, 1918, at the National Zoölogical Park in Washington, and Mr. Wormald has seen it. The throw-back is like the Red-head's but it is not indulged in so often and as nearly as I can find out the head is never placed so far back over the tail. The note which is uttered at the time, is almost exactly like the Red-head's. Wormald described it to me as like a "wheezy Pochard." I often saw my own birds execute what I suppose might be called a partial display, during the month of April. The males, sometimes several at once, would suddenly stop swimming and run their necks up stiffly to a very erect position, with their bills tilted upward well above the horizontal, while this position was held from one to several seconds. A lump often appeared under the chin at this time, caused apparently by inflation. Sometimes the bill was waved about in the air as if the bird were trying to catch flies. The females at the same time executed similar movements, but these were not carried out to so marked a degree. During all this there was not a single sound uttered by either sex. Mr. Harper saw the same curious neck-stretching in the field. In his manuscript notes he says: "On June 17 I noticed a little courtship activity on the part of two males that were interested in a female. One of the former had its neck stretched up, and threw up its bill a little. If it gave any note at the same time, it was impossible for me to tell at a distance of two or three hundred yards. Then the female took to wing, and the males followed, one of them trying to fend off the other on the way. After alighting, the males seemed to continue throwing up the bill, but not actively. In the meantime the female dove for food, having probably come hungry from the nest. The whole affair was rather tame." Evidently, then, the so-called pursuit flights do occur among diving ducks as well as among surface-feeders.

DISPLAY ATTITUDES

(Upper) RED-HEADS (Lower) CANVAS-BACKS

Canvas-backs arrive on their breeding grounds no later than the mass of surface-feeders, but the nesting period is not particularly early. Evidently they do not pair up until late March or early April and the last ten days of May and the first half of June constitute the usual laying period. Nests were found as early as May 18 in North Dakota (Job, 1899). Another early date is May 21 for British Columbia (A. Brooks, *fide* J. and J. M. Macoun, 1909). At Barr Lake, Colorado, full complements were found on June 15 (Rockwell, 1911). Most of the other dates vary from late May to mid-June for North Dakota, Saskatchewan, and Alberta. Farther north, Harper (MS.) found several nests on the lower Athabasca between June 18 and 21. Later clutches are, of course, common in all these regions, and nests are found up to July 1. Some of these are second clutches after the first have been destroyed.

The nest site is the same as that of the Red-head and the Ruddy Duck. Thick beds of dead reeds, bulrushes or tules standing in shallow water or mud are the localities usually chosen. Like other diving ducks, the Canvas-back seeks inaccessible places such as islands and impenetrable bogs. At Prince Albert, Saskatchewan, a nest was found placed in the base of a willow-bush standing in water; another was in a tussock of dead grass in a small slough (Ferry, 1910). Both in southern Saskatchewan and in Colorado nests were found placed in burrows dug into the top of muskrat houses (Spreadborough, in J. and J. M. Macoun, 1909; Rockwell, 1911). Usually nests are well concealed, but sometimes they are located in rather conspicuous positions among open scattered rushes.

The nest itself is a bulky structure, ordinarily made of dead flags or sedge, eight or twelve inches above the water, and sometimes with an inclined runway leading to the top of one side, which the female seems to use in going to and coming away from the nest. The outside diameter of the nest is about fourteen inches, and the inside about seven to eight inches (Bent, 1901–02).

The interior is usually well supplied with down of a gray color, which is easily distinguished from that of other species, especially that of the Red-head, by its darker color (A. Brooks, 1903; Bent, 1901–02; Wolfe, *in litt.*). The normal clutch varies from seven to ten, the average being perhaps eight or nine. The largest clutch I find recorded was taken in Colorado and contained fourteen eggs (Rockwell, 1911) and sets up to twelve are not unusual. Job (1902) places the average at ten or eleven, but adds that at times he only found seven. So many other nests have been found with only seven eggs that I think Job's estimate may be somewhat too high.

Both the Red-head and the Ruddy Duck utilize the Canvas-back as a foster mother, but all observers are unanimous in saying that the Canvas-back attends strictly to its own business and does not invade the sanctity of its neighbors' homes.

The eggs are rich grayish olive to greenish drab in color and measure from 59.9–65.3 mm. in length and from 42.6–45.7 mm. in breadth. The average is 62.8 by

44.4 mm. They are easily told from those of other species by their darker color (Bent, 1901–02).

The incubation period is the same, or at any rate very nearly the same, as the Red-head's, twenty-two or twenty-three days. Mr. Wolfe wrote me that some which he put into an incubator came out in twenty-one days, but artificial heat brings them out a little sooner. Mr. Wormald hatched out some eggs in England, which had been shipped to him all the way from Alberta, and the few that were fertile took twenty-eight days, but this was, of course, an abnormal case in every way.

During sitting the females usually leave the nest in the warmer hours of the afternoon, at first joining their mates. Soon, however, the males withdraw to other places and see no more of their dutiful partners. They do not start to moult very soon; according to Harper's observations there was a period up to the 10th of July when there seemed to be no change in their appearance. Those which I have had in confinement kept their winter plumage much later than all other ducks, including Red-heads and Scaups, but it is not safe to draw deductions from observations made on captive birds, especially Canvas-backs, because they are rarely in vigorous health when kept in small enclosures.

Canvas-backs probably breed the first year, although this does not necessarily apply to all individuals. A male bird hatched by Mr. Wolfe of Edmonton, Alberta, was sent to a gentleman at Port Hope, Ontario, where the following spring, when only one year old, it mated with a female Mallard, the union resulting in a brood of seven hybrid ducklings.

Status. Except for the great decrease noted on the famous shooting grounds of the Chesapeake since the early nineties, the Canvas-back seems to be holding its own rather well. In recent years there is good evidence to show an increase, both in the East and in the West, and it seems to me that this duck has responded to increased protection better than any other species of diving duck. Drainage and agriculture are continually advancing over the breeding grounds, which results in the complete disappearance of many ponds and the gradual lowering of the water in many others. The whole water-table seems to be sinking in much of the wheat country of North Dakota, but, on the other hand, the Canvas-back's breeding range extends well to the north which is a fact of the highest importance to its future.

On the once-famous marsh at Monroe, Michigan, great bags were formerly brought in during the autumn flight between the years 1895 and 1901. During that time the "Cans" exceeded the Red-heads by a wide margin and comprised about 16% of all the ducks shot. It is interesting to note that during the same period only half as many "Cans" as Red-heads were shot during the spring months. Both these species together were outnumbered five to one by the Scaups at this season. This marsh has long since been ruined by the extension of the city of Monroe.

At Long Point, Lake Erie, only a short distance farther east, the figures show a situation quite the reverse, for up to 1901 the Canvas-back was an extremely rare duck there. From one to two specimens a year (23 in twelve years), the numbers suddenly jumped to 161 in 1901 and 814 in 1905. In 1913 no less than 1373 were taken, and this was the banner year. During the period from 1901 to 1920 the Canvas-backs represented 3.7% of all ducks shot at the Club, but even now they are very irregular in their numbers, only 99 having been taken in one season (1911). They seem far less dependable than the Red-heads and actually more than twice as many Red-heads as Canvas-backs are killed there. Such figures, however, do not always represent actual status, because these "Canvas" at Long Point are killed in the deep part of the marsh and in some seasons they do not come into the marsh, although there may be plenty of them on the neighboring bay.

Mr. W. B. Mershon (*in litt.*) is very certain that the Canvas-back was extremely rare on the Saginaw River, Michigan, in his father's time. He adds that among the many ducks which his father shot he can recall only one Canvas-back.

Canvas-backs take nearly the same direction as the Red-head in crossing from the Great Lakes to the Atlantic coast, but for some reason or other they are far less common than the latter in New England.

Mr. S. P. Fay in a long paper published in the Auk, in 1910, concluded that this duck had been increasing rapidly in eastern Massachusetts during the previous decade. There certainly was a brief period from about 1901 to 1905 when Canvas-backs were unusually common, but I doubt whether this was anything but a temporary fluctuation. They are birds with so irregular a dispersal that long periods must be considered in trying to reach an estimate of their abundance in any given locality. My own records for Wenham Lake show that in the twenty years considered, only 13 Canvas-backs were taken, that is 0.4% of all the ducks, a list which represented 25 species. During the same period and at the same place 103 Red-heads were shot and a good many others noted. The only place in Massachusetts where the Canvas-back is even tolerably common is the south shore of Martha's Vineyard Island, where *Vallisneria*, besides other attractive pond-weeds (*Potamogeton nuttalli* and *perfoliatus*) grow in profusion. Here, as before mentioned, S. P. Fay considered them on the increase between 1905 and 1910.

A similar statement was made concerning Maine by Norton (1916). He cites about 25 different records from Maine, up to that time. It is true that a few Canvas-backs as well as Red-heads are shot in Merrymeeting Bay on the Kennebec River during some years. A gunner of long experience tells me that he shot several of them in 1921 and saw others in 1922.

A few Canvas-backs touch at the Great South Bay region of Long Island, the Barnegat Bay and other points on the New Jersey shore and in Delaware Bay. As many as five thousand have been estimated in winter (December 23, 1922) below Washington, D.C., on the Potomac River (Bird-lore, vol. 24, p. 26, 1922).

The famous fresh- and brackish-water bays of the upper Chesapeake, from Havre de Grace to Baltimore, as well as the lower James River were once the greatest wintering grounds of the Canvas-back on the Atlantic coast, and up to twenty-five or thirty years ago they seem in that favored region to have exceeded any other species in numbers. The tremendous persecution which went on there both by night and by day in waters that were easily accessible for shooting, resulted in a steady diminution, which began long before the time of Wilson and Audubon.

Still in the fifties they must have been very numerous if one can judge anything from reading E. J. Lewis's (1855) account. At that time the modern battery had just been introduced, resulting rather commonly in bags of 100 Canvas-backs in a day. There is mention of 187 ducks killed in a day and during the season of 1846–47 one gunner is said to have killed 7000 Canvas-backs! During the Civil War the ducks got a much-needed rest and then in the late sixties and seventies the shooting was still splendid and the popularity of the many famous old clubs was at its zenith. Then from about 1880 a change came. But the climax was reached in the early nineties when the river mouths were silted up by floods. In recent years I understand that as a result of carefully restricted shooting there has been some increase of diving ducks there. Within the last twenty-five years I have known of great bags of Canvas-backs being occasionally taken in Currituck, from 40 or 50 to around a hundred, but such days are very exceptional indeed. Anything over 12 or 15 of these fine birds was always considered good.

Reliable figures are lacking for the Back Bay of Virginia and Currituck Sound, because relatively few Canvas-backs were ever shot by visiting sportsmen at the shooting clubs. Nine-tenths of them were secured by market gunners, shooting from bush blinds and batteries in the open sound. When all the markets for ducks were closed by Federal Law in 1918 it seemed as if the diving ducks, and especially the Canvas-backs, would have a rest, because only resident shooters were allowed to take birds from a battery. But the local market shooters, being thrown out of work, have succeeded in having the law modified and now make a business of taking out hundreds of sportsmen. Meanwhile non-residents bought cottages, took out residence papers and began to beat the law in this way. And now, sad to relate, the batteries are steadily on the increase and the diving ducks are more harassed than ever. The only bright spot in their existence is the fact that most of the visiting sportsmen are not over-destructive to the ducks. But even this picture has its lugubrious side, for the pampered city sportsman soon tires of his cramped position in the battery and ends by ordering the ex-market gunner to help pad his slender bag. It is difficult to see what the final result will be. Battery shooting ought to be limited to waters of great size such as Pamlico. But if this were done the local shooter could get scarcely any ducks, as the clubs control all the marshes and points. I think the only solution

will be the creation of a sanctuary of suitable size in this region, where the fowl can find a haven all of the time.

It is hard to estimate actual numbers of Canvas-backs in Currituck Sound and the Back Bay. In January, 1922, I certainly saw from 15,000 to 25,000 "using" in a small area of water not far from the Virginia-Carolina state line. A good description of the great numbers of "Cans" seen during a heavy freeze at the south end of Currituck Sound may be found in G. B. Grinnell's book (1901).

At the Currituck Club Canvas-backs comprised only 0.3% of the total number of ducks taken between 1888 and 1910, and some of the other clubs shot even less. Few "Canvas" come into the marsh ponds unless they are slightly crippled, when they are known in the local jargon as "Skuks" or "Skuksies."

Although occasionally resorting to parts of Pamlico and Albemarle Sounds after a heavy freeze farther north, there are no regular stamping grounds in these waters except for small areas at the brackish mouths of one or two rivers. At the famous ducking regions at the mouth of the Santee River the species is really scarce. I find that only 25 were shot by the Santee Club during the seasons 1901–02 to 1908–09 inclusive, out of a total of over 22,000 ducks. At Oakley, South Carolina, only nine were taken in the years 1916–23 out of a large number of other ducks. As showing how uncertain generalizations can become, I find that Audubon thought the Canvas-back by no means uncommon on the Santee delta and near Charleston. Farther south there is very little good Canvas-back ground, although in exceptional years a few turn up in the vicinity of Cape Canaveral, Florida. Out of a very large total of ducks shot there in the thirteen years, 1908 to 1921, only nine appear on the Club's books. All over the rest of Florida it is considered a rare duck; according to Harper (U.S. Biological Survey) not quite so rare as the Red-head. Audubon mentions finding them in considerable numbers on the inlets of East Florida rivers!

When Beyer, Allison and Kopman (1907) compiled their list of birds of Louisiana they spoke of this duck as decreasing. The Mississippi Delta and the inland waters to the westward are favored by Canvas-backs here and there, but not, I believe, in any such large bodies as on the Atlantic coast. In the season of 1913–14 only 1037 were reported by the Conservation Commission of Louisiana as having been marketed out of a total of over 283,000 ducks. This is only 0.3%.

Although it is reported as abundant on parts of the coast of Texas and on the lakes of Mexico all the way from Chihuahua to Mexico City, we know very little of its actual numbers there in winter. The interior lakes of Mexico are almost *terra incognita* as far as their winter population of migrant water-birds goes. I feel sure we shall find surprising numbers of our ducks wintering there.

In California the Canvas-back is sometimes numerous on San Francisco Bay and on the waters of the interior. Its numbers vary greatly from year to year and there is a common saying among sportsmen that every fourth year is a good "Can" year.

Drainage and increased population have greatly reduced the available feeding grounds; even great sheets of water like Tulare Lake have been completely dried up.

Market statistics for the San Francisco region show that Canvas-backs are much more numerous than Red-heads; possibly some of the latter were passed off on the public under cover of their brethren's more famous name. In the season of 1910–11 the American Game Transfer Company received nearly 2000 Canvas-backs out of a total of 71,793 ducks. The Hunters Game Transfer Company marketed 7067 "Cans" out of a total of over 357,000 ducks in the five seasons, 1906–11; this was about 2% of the aggregate. In the season of 1910–11 five large transfer companies together handled 8552 Canvas-backs out of a total of 185,900 ducks; in other words, this species comprised about 4.5% of the total number (Grinnell, Bryant and Storer, 1918).

Nordhoff (1922), in a note written presumably from memory, thinks that shooting clubs at Banning, Riverside County, California, used to take two Canvas-backs for one of any other duck, but memory is a poor guide in matters of this sort. I cannot conceive of such proportions ever having been killed anywhere.

At the mouth of the Columbia River, Washington, this species is said to occur in "immense flocks" (Kobbé, 1900), and the same is true of parts of the Puget Sound region of Washington.

In the interior the Canvas-back has been reported as on the increase as a breeder in western Nebraska (Oberholser, 1920). In North Dakota it used to be much more abundant as a nesting bird, but its distribution has been affected by drainage, and it has disappeared in Towner County (Bent, 1901–02). Periods of drought previous to 1922 almost ruined this State as a resort for ducks, and these same conditions prevailed over a good part of the wheat regions of the West. Still Mr. Mershon (*in litt.*), who has shot in Kidder County, North Dakota, since 1894, thinks he has noticed a great increase both there and at Buffalo Lake, Alberta. C. B. Horsbrugh (1915), who collected at the latter place, thinks otherwise, and so does Stansell (1909) writing of central Alberta. The truth is that conditions at any one place are always changing, so that minute observation there may not be any criterion of a general increase or decrease.

Figures compiled by the Minnesota Commissioners show that fewer Canvas-backs than Red-heads are shot in that State. It ranks as the sixth or seventh in order of abundance.

In the central part of its breeding area, on the Athabasca delta, Harper (MS.) found it the sixth commonest duck. He noted 15 individuals in May, and 126 in June.

Enemies. The Canvas-back is prey to all the ordinary enemies of the duck tribe, but undoubtedly the Common Crow is the most destructive to the eggs.

Lead poisoning from shot has been found among Canvas-backs at Lake Surprise, Texas. Some of these sick birds could dive, but were unable to fly (McAtee, 1908).

Food Value. The fame of the Canvas-back's flesh has spread not only over this country, but over Europe, whither some were formerly sent in cold storage (Elliot, 1898). They gained their reputation chiefly from eating the rich grasses of the Chesapeake, but those from Virginia and North Carolina are nearly if not quite as good. From both these favored regions they are occasionally driven by a hard freeze and are then forced to eat eel-grass and animal food, becoming "strong" in a few days. Audubon noted that the birds from the vicinity of Charleston and Savannah were inferior to those of the Chesapeake. The Canvas-backs of the Mississippi Delta and Louisiana are as a rule good, but are not generally regarded as equal to those of Chesapeake Bay. California birds are inferior, as the *Vallisneria* does not grow there, but those from some of the north-central States and the Great Lakes region are very fine. None of the birds from the Pacific Coast seem to be especially good and as before remarked they are accused of eating dead salmon in the State of Washington. Those stragglers killed on our home waters here in New England are not often particularly well flavored.

If the price paid for this duck is any indication of the merit of its flesh it must stand at the top of the list with only one rival, the little Ruddy Duck. When Canvas-backs were selling in the New York and Boston markets at $6.00 to $8.00 per pair, these little birds which weighed only a pound brought $2.50 a pair, and sometimes more. As a rule, Canvas-backs sold for two and one-half to three times as much as Mallards. Toward the close of the market-gunning days the shooters of Currituck were getting as high as $4.00 a pair right on the wharf, but the average price was lower, around $3.00. Even in Audubon's time, in 1837, they were bringing $2.00 a pair in New Orleans, but the price, he says, had recently risen from a very low figure. Alexander Wilson writes that Canvas-backs sold at from $1.00 to $3.00 a pair in his time, the latter figure an enormous price for those days. E. J. Lewis (1855) speaks of Canvas-backs as selling at very low prices at Havre de Grace, especially during good seasons, and there is mention of a lot sold at Egg Harbor, New Jersey, where they had assembled around a wrecked wheat vessel, for twelve and one-half cents each! But these, of course, were exceptional prices and in the latter case the identity of the birds was not surely known (A. Wilson, 1832).

At one place which I visited in southern Louisiana I was served a most delicious meal consisting of broiled Canvas-back livers on toast. It seemed to me that I had never tasted anything better. The Canvas-backs of this whole region, and also from Galveston Bay are said to be extremely good.

To sum up, many discriminating palates have tried to damage the fame of the Canvas-back by lauding other species and possibly they have in part succeeded.

But his early reputation is too firmly established to be so easily shaken, and he will always remain, I think, at the top of the list. The large size places him above the Ruddy and the Widgeon, both of which ducks come very close to him in actual quality of flesh. The broad and deep chest gives him an ideal shape and he is far easier to pluck than the Ruddy.

HUNT. The pursuit of the Canvas-back usually goes hand in hand with the taking of several other species of diving ducks: Red-heads, Scaup, and Ruddies. At the same time a few Widgeon, Pintails, and in some places Geese, may help to fill the bag. No doubt if one took the trouble to hunt through the files of some of the old periodicals of Baltimore or Philadelphia he might find some very early accounts of the shooting in the Chesapeake. From the material which I have before me we can only go back about a hundred years. First it is well to mention the more famous of the Chesapeake waters where seventy-five or a hundred years ago there was probably as fine shooting at Canvas-back, Red-head, Widgeon, Geese and Swan as ever existed anywhere. More than this the birds were especially favored by a great abundance of food, notably great beds of *Vallisneria*, the so-called wild celery or tape-grass, beloved of all the duck, goose and swan tribe. The most famous places were about the mouths and lower reaches of several rivers emptying into the head of Chesapeake Bay. These were the points immediately about Havre de Grace, the narrows of Spesutia, a few miles farther down, Taylor's Island, Abbey Island, Legoe's Point, Marshy Point, Bengie's Point, Robbin's and Ricket's Point, Maxwell's Point and Carrol's Island. At this last place was the famous Carrol's Island Club where the Baltimore sportsmen obtained some of the finest flight shooting in North America. The ducks there flew over a long neck of land in their morning and evening flights and provided the most sporting shots. I have often heard one of the old members of this Club, the late Mr. Norris of Baltimore, describe the old days there.

In this same region there were also good points about Elk and Northeast Rivers, and a few on the western shore. The most famous rivers were the Bush and the Gunpowder.

The most destructive method of shooting Canvas-backs is by the battery-boat, a good description of which will be found in E. J. Lewis (1855), G. B. Grinnell (1901) and other works. At first, small boats called dug-outs were built which could be sunk down with weights until just the edges of the gunwales come above the water. These were anchored over the best feeding grounds, covered with weeds and surrounded by decoys. Later on, perhaps in the late forties, the modern sink-box, with wide folding wings, was invented. This deadly device is now built in uniform style all the way from New Jersey to Pamlico Sound. The wings are covered with canvas and the whole is weighted with iron decoys and surrounded by a fleet of several hundred wooden ones. It takes a long time to put out such a rig and each battery is served by

a stoutly built gasoline-driven boat, which carries the battery across the gunwales, besides towing a light skiff for the stool ducks.

Batteries are made both single and double and in two forms, the "lying-down type" and the "sitting-up type." The latter is a little more comfortable for the novice to accommodate himself to, but cannot be used on very shallow waters.

Restrictions of one sort and another are placed on batteries in different counties. In many places they are prohibited, in others limited in numbers, requiring a special license. Another way was to forbid all non-residents to shoot afloat which gave the market shooters control of the open water. This, however, is being modified, for the former market shooter depends more and more on the visiting sportsman. In the near future, either batteries will have to be limited much more, or else certain water areas will be set aside as permanent sanctuaries. The last method would probably prove the fairest to all concerned.

The bush blind made by driving cedar bushes and myrtles into the mud around the floating boat is another successful method. These bush blinds were left out through the whole season and were often baited with grain. Nowadays a man is only allowed to use one of these in North Carolina. In some places they used floating bush blinds particularly where the tide was strong.

An early method, and one given up a great many years ago, was well described by J. J. Sharpless in Doughty's Cabinet of Natural History, published in 1830–33. This is the primitive practice of tolling ducks toward the shore by means of a specially trained dog playing upon the beach. All the diving ducks respond to the lure of a dog, but the Scaups and Red-heads come even more readily than Canvas-backs. Often all three species were tolled at the same time. Tolling on the Chesapeake must have been given up long ago or else used early in the season only, for it requires of course undisturbed waters and lazy ducks. No doubt the idea was borrowed from the decoy men of England or Holland. E. J. Lewis says that the method was discovered quite by an accident. A sportsman who was watching a flock of ducks suddenly found that they became attracted by a fox playing on the shore. This tolling was also practised in old times on Martha's Vineyard Island in Massachusetts and doubtless in other places where conditions favored it. At times ducks could be brought within shot merely by waving a red flag from a concealed position, or using the flag and the tolling dog at the same time.

There were many other methods of getting at Canvas and other ducks in the old days. Gill nets were sunk a short distance under water but it was found that the flesh of ducks so taken was inferior. All sorts of craft crept upon the vast flocks, especially at night, and great execution was made with huge muzzle-loading swivel guns. These were forbidden by law early in the last century, but it was a long time before the practice was really stopped. Another practice was in vogue on Lake Erie (Long Point Bay) where the wild-fowler anchored out a big fleet of decoys and

then, after Canvas-backs had come to them, drifted down upon them in a shallow skiff.

Flight shooting at ducks passing over necks of land was very successful in the upper Chesapeake, especially at such places as Carrol's Island. Many were shot from points over a big stool of wooden decoys, and still are for that matter, but it is unusual nowadays to make a large score off a point unless the weather is very rough and the birds fly by near enough to be drifted close to the point by the force of the wind. A bad time for Canvas-backs is during one of the freezes which closes such sounds as Currituck, but leaves open air-holes which can be reached over the ice. At such times I have seen the market shooters take huge toll of Canvas-backs by shooting from a bush blind at the edge of the hole. In the Chesapeake they used to go to the trouble of cutting holes in the ice near the shore, in order to decoy the birds within range. I have done this myself at Currituck but have never gotten many Canvas-backs.

Of course there are many places where Canvas-backs will come right into enclosed waters with Red-heads, Widgeon and other ducks and in these places they are decoyed easily by putting out a sufficient number of white-backed wooden decoys.

It might not be out of place here to note a few dates in the progress of game conservation in the United States; to follow the spread of State protection and the gradual removal of wild-fowl from the markets of the country up to the time of their complete exclusion in 1918. In 1901 Michigan prohibited the sale of all protected game, and this action closed the markets of Detroit and other cities in the State to the sale of water-fowl. In 1903 Illinois prohibited traffic in water-fowl killed in the State, which had the effect of closing the markets of Chicago to the sale of ducks killed along the Illinois River and curtailed traffic in water-fowl in that center very materially. A similar law was passed by Pennsylvania in 1917, but as the supply of ducks sold in Philadelphia was chiefly received from other States, the effect was less than in the case of the Illinois statute. In 1905 Missouri and Oregon prohibited the sale of practically all game, thus closing the markets of St. Louis and Portland to the sale of ducks. In 1911 New York passed the Bayne law prohibiting the sale of native game, but permitting traffic, under a tagging system, in certain kinds of imported game and game raised in captivity. In 1915 a similar law was enacted in Massachusetts. The sale of water-fowl persisted in the markets of Baltimore, Washington, New Orleans, and San Francisco, although under some restrictions until the passage of the Federal Law of 1918.

Behavior in Captivity. Although the Canvas-back has always been so greatly admired it has not been kept under fence as often as one would suppose. Adult-caught birds do not live as well as Red-heads, and like Scaups are apt to die in the course of a year or two. None of mine ever lived over two years, but no doubt this

period could be lengthened if a pond with plenty of natural food was provided. Doubtless, too, hand-reared birds live a good deal better than wild-caught ones. It may be that a healthy stock of hand-reared birds will sometime be found on the market.

Only once, so far as I know, has this duck been bred by any one. In 1913 some individuals reared by Mr. H. K. Job from eggs gathered wild in Manitoba were brought to maturity on the estate of Mr. William Rockefeller. They were placed in charge of Arthur M. Barnes. In 1914 there was no sign of breeding, but in 1915 a drake was seen constantly patrolling a certain portion of the lake. The nest was found not over two feet from the shore with six eggs in it. The long pliable twigs of a weeping-willow tree had been used in constructing it and it measured 2½ feet broad at the base and was built up six inches from the ground, forming a bowl six inches in diameter, lined with a few feathers but very little down. The female was allowed to incubate for three weeks, when the eggs were taken and placed under a hen. The foster mother brought out three ducklings, two of the eggs proving infertile, and a third having a dead embryo about two weeks along. These ducklings were rather wild at first and there was some trouble in getting them started, but they were all successfully reared (A. M. Barnes, 1915). Mr. Job told me that this pair of birds bred again successfully.

So far as I know nobody until recently has kept this duck in Europe, and it does not seem to have been exhibited in the London Gardens. Miss Hubbard (1907) mentioned a shipment obtained by the dealer, Mr. Jamrach of London, all of which died. Mr. Blaauw of Holland and Mr. H. Wormald of Norfolk, England, both told me they had never been able to get live specimens. However, the latter gentleman very recently reared two to maturity from eggs sent to him from Alberta. And in 1922 six or eight hand-reared specimens which I shipped to him arrived safely. I saw these same birds in his ponds in 1924 and they looked in perfect condition and were wonderfully tame. They were then two years old and although one pair had shown some signs of nesting, none of them had laid any eggs.

My own Canvas-backs proved very attractive on the water but not especially interesting to watch. They got lazy and spent much time standing on the cement rim of their pond in anything but graceful attitudes. They should be kept amused by having something to dive for. When I first placed them in their quarters they dove actively for the frogs' eggs and tadpoles which abounded, but after these were used up they did not have enough to do. I sometimes put a few minnows into the pond and these they chased as actively as the Red-heads and Scaups did. I never saw the full display from my birds but only the peculiar head and neck attitudes described under Courtship and Nesting. My specimens moulted very late, scarcely beginning until the end of July and they never assumed a perfect eclipse. It is not especially difficult to rear these birds from wild-gathered eggs,

judging by the experiences of Mr. Job in Manitoba and Mr. A. Wolfe at Edmonton, Alberta.

I have recently heard that a male Canvas-back reared by Mr. Wolfe mated with a female Mallard the first spring and the union resulted in young. It is not certainly known whether or not the bulk of wild individuals nest when only one year old, but I assume that this is the case.

Hybrids. Hybrids between this and other ducks must be extremely rare. A wild hybrid between the Canvas-back and the Lesser Scaup (*Nyroca affinis*) is reported in the British Museum Catalogue (Salvadori, 1895).

In confinement this species has been mated with a female Mallard in the hands of a gentleman at Port Perry, Ontario, the union resulting in nine eggs which produced seven ducklings (A. Wolfe, *in litt.*). I do not know whether or not these were ever reared to maturity. The race of ducks described by Dr. T. M. Brewer (1874) from a farmyard in Pennsylvania was probably not the result of crossing Mallards with Canvas-backs as he supposed, for there is little likelihood that such a combination would produce fertile offspring.

COMMON POCHARD

NYROCA FERINA (LINNÉ)

(Plate 56)

SYNONYMY

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Aythya ferina Boie, Oken's Isis, p. 564, 1822.
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Aythya ruficeps Brehm, Naumannia, 1855, p. 258.
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Aethyia ferina Giglioli, Ibis, ser. 2, vol. 1, p. 52, 1865.
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Nyroca ferina ferinoides Kuroda, Dobutsugaku Zasshi, vol. 32, p. 245, 1920.

VERNACULAR NAMES

English: Pochard, Dun-bird, Poker, Red-head, Red-eyed Poker, Red-headed Wigeon, Snuffle-headed Wigeon, Red-headed Curre, Dun Curre.
German: Tafelente, Tafelmoorente, Rothals, Rotkopf, Braunkopf, Sumpfente, Rotmohr, Quellje, Kohltüchel, Düker, Knollente.
French: Milouin, Rouget, Tétard à tête rouge, Molleton, Nonant, Pilet maillé, Pilet cendré, Plumard, Moreton, Morillon à tête rouge.
Italian: Moriglione, Collorosso, Anga sarvaega, Moraeton, Magasson, Monaro, Scapola, Bosco, Moju, Scavuni.
Danish: Taffeland, Brunnakke, Rödnakke.
Norwegian: Taffeland, Rodnakke, Kiaerns and.
Swedish: Rödhalsand Dykand, Brunand, Brunta.
Icelandic: Skutulönd.
Gaelic: Lacha-mhasach.

Finnish: Punasotka, Punatelkkä.
Esthonian: Bruhnkaklis, Raudawa.
Russian: Rijegolowka, Tebernedj, Krasnogowaja, Krasnogolowy i nyrok.
Polish: Kaczka ponur.
Hungarian: Hamvas, Barát récze, Veres nyak.
Tartars: Kermesibrasch-giri.
Kirgiz: Soksur iyirick.
Indian: Boorar nur, Lall-sir (Northwest Provinces); Lall muriya (Bengal); Cheoon (Nepal); Thordingnam (Manipur); Rutubâh (Sind); Surkhsir, Ghotye (Kabul).
Yakut: Toipas.
Ostiaks: Pom-lopte.
Dutch: Tafeleend, Roodkop, Valinger.
Arabic: Homari.
Bosnian: Ridžak.
Croatian: Patka kaljuža, Patka glavata.
Czech: Polák velký.
Dalmatian: Golubak.
Maltese: Braimla hamra.
Portuguese: Tarrantana, Catullo, Zorro.
Spanish: Cenizo, Boix, Moixó, Anach gavaitg, Caproitg, Buixot, Cabezon.
Tunguse: Dúrutu.
Tibetan: Yteakung.
Japanese: Hoshihajiro.

DESCRIPTION

Adult Male: Head and neck uniform ruddy chestnut. Mantle black, scapulars on anterior part sharply distinguished from the finely vermiculated white and black of the posterior part. Scapulars like the lower mantle, but the vermiculations somewhat coarser on the long feathers. Back, rump and upper tail-coverts black; tail nearly black; breast black, abdomen silvery gray, but more or less finely vermiculated and shading into much darker color on the posterior part. Under tail-coverts black; wing-coverts like the scapulars; secondaries also gray without any well-defined speculum. Primaries brown, darker at the tip and on the outer web. Tertials nearly like scapulars, but darker. Under surface of wing white.

Iris ruby red during and before the breeding season like that of our Canvas-back; more yellowish at other times. It is even said to change color with fright (Stevenson and Southwell, 1890). Bill black with a broad band of bright blue across the middle. Legs and feet bluish gray with the webs black or blackish.

Wing 213–224 mm.; bill 45–49; tarsus 36–40.

Weight 2 pounds, 2 ounces to 2 pounds, 6 ounces (0.96–1.07 kilograms); rarely to 2 pounds, 8 ounces (1.13 kilograms).

Adult Female: Top of head dark brown; sides of head brownish, shading into buffy white on the chin and throat. Mantle dark brown, scapulars gray, finely vermiculated with dark brown, making a much darker effect than in the male; rump, upper tail-coverts and tail dark brown to black; upper breast

dark brown shading into a slightly mottled pale-gray abdomen and flanks. Lower abdomen darker and under tail-coverts blackish brown. Outer wing-coverts grayish brown without vermiculations; speculum plain gray; primaries dark brown; under wing silvery white.

Iris brown to hazel-brown. Bill like the male's but colors not so brilliant. Legs and feet dull slate-color to horn-color; webs black.

Wing 201–212 mm; bill 43–47; tarsus 35–40.

Weight 1 pound, 5 ounces to 2 pounds, 4 ounces (0.59–1.02 kilograms).

Young Female in First (Juvenal) Plumage: Resembles adult female but is more brownish and mottled on the abdomen, lacking the silvery-gray appearance of old birds. The mantle and scapulars have a more uniform appearance and lack the light edges of later life. The tail-feathers will also be found to be blunt at their tips.

Young Male in First Plumage: Like the female at corresponding age but the head is redder. In September or early October a few black feathers appear upon the upper breast or around the lower neck, at the same time that vermiculated feathers appear among the scapulars. Early in the autumn the head begins to assume a dull-red tone, and it may be almost as red as in adult long before the mantle and breast have become black. The tail-feathers in these young males will be found bleached out or worn at the tips. Adult plumage is not entirely perfect during the first spring but all essential changes are complete by late January.

Male in Eclipse Plumage: As given by Millais the male assumes a plumage which can never be confused with that of the female. The scapulars and lower mantle are gray with some vermiculations, but the colors are darker than those of the spring. The black regions change to dark gray, each feather edged with yellowish white or russet. The crown becomes dark brown and the cheeks and remainder of the head and neck red-brown. The flanks are mixed with vermiculated gray feathers and dark-gray feathers with sandy edges. The rump remains dull black. The bill at this season is dull bluish black and the irides have lost the brilliant red color.

Young in Down: Like our American Red-head, yellow-brown on crown and upper parts with the light wing-, scapular-, and rump-patches poorly defined. Sides of head uniform sulphur yellow without markings. Lower surface like face and throat and without darker area across breast. Millais says that in life the upper mandible is dark brown becoming a little lighter toward the nail which is dark flesh-color. The lower mandible is light flesh-color. The feet and legs are partly black and partly olive-yellow.

Remarks: Mr. N. Kuroda (Dobutsugaku Zasshi, vol. 32, p. 243–248, 1920) has recently separated the Pochard of Japan on the basis of a deep-red eye in the male and a shorter wing-length in both sexes. Eye-color is certainly a very unreliable character, as it varies from orange to orange-red and even brilliant red in European specimens, depending on the age of the bird and the time of year. It has even been noted that the eye changes color while the bird is being handled, due perhaps to fright (Stevenson and Southwell, 1890). Millais (1913) and other recent writers have noticed that the eye is a particularly brilliant ruby red during the period of sexual excitement.

The wing-length of five Japanese males given by Kuroda is only 10 mm. more than the measurements given in Witherby *et al.* (1919–22), Handbook of British Birds, these last measurements being based on large series of European birds. Hartert (1920a) gives the measurement of the wing as 224 mm. at the most, but the great curve in the wings of diving ducks makes it necessary to use exactly the same method of measuring if results are to be compared. It may turn out that East Asiatic Pochards are a slightly smaller race, but the material at my disposal is too small to allow a decision.

DISTRIBUTION

The Common Pochard is one of the characteristic ducks of the palæarctic region, breeding throughout much of Europe and the western parts of Asia. The northwestern limit of its range is Iceland, for

Iceland which there is one reliable record, namely, June 20, 1860 (Hantzsch, 1905). On the

Faroes Faroes it has been taken several times (*ibid.*) but there is no record of its breeding there.

British Isles On the Shetlands also it appears to be only a migrant or winter visitor (A. H. Evans and Buckley, 1899) though it has bred on Hoy in the Orkneys (Buckley and Harvie-Brown, 1891) and on the Hebrides (Millais, 1913). On the Scotch mainland the species nests in suitable localities throughout, having been reported from Stirling, Perth, Tay, Kinross, Fife, Ross, Moray, Elgin, Nairn, Roxburgh, Berwick, and Wigtownshire (Millais, 1913; *et al.*). The breeding range in Great Britain has been extending in recent years, so that now the Pochard is known to breed in almost all the English and some Welsh counties, there being records for all east-coast counties from Northumberland to Kent, as well as for Hants, Dorset, Sussex, Herts, Bucks, Berks, Beds, Staff, Leicester, Notts, Salop, Lancs, Merioneth, and probably Anglesey (Millais, 1913; Witherby *et al.*, 1919–22; and numerous others). In Ireland it has been reported breeding in counties Kerry, Tipperary, Westmeath, Meath, Sligo, Down and Antrim (Ussher and Warren, 1900), though the only really reliable breeding record is one for Monaghan, 1907 (Ussher, 1908).

On the Scandinavian peninsula the Pochard is by no means a common bird. There is no record

Norway of its ever having bred in Norway, though Collett (1873) speaks of it as resident on the

Sweden southwest coast. In Sweden it is said to have bred in Östergotland, on Öland and on Gotland (Dresser, *fide* Millais, 1913), while in Denmark it breeds regularly in small

Denmark numbers (Winge, Schiöler, *fide* Millais, 1913; "G. L.," 1918). A few nest in northern

Belgium Holland, especially in Brabant (Allarda, van Oort, *fide* Millais, 1913; Snouckaert van Schauburg, 1908) and I imagine in Belgium, too, though there is no available evidence

France to substantiate this. As for France there seems to be no record of nesting beyond that

Spain of Lacordaire (in Paris, 1907) who states that the Pochard breeds in the departement Haute-Saône. It is an equally rare breeding bird in Spain, on the Albufera of Valencia, in the *marismas* of the Guadalquivir and in La Mancha (H. Noble, 1902; A. Chapman and Buck, 1910), but is not known to have nested ever in Portugal.

In Germany the Pochard is a fairly common breeding bird, especially in the northern and eastern parts. Naumann (1896–1905) states that it has nested in Mecklenburg, Brunswick, Brandenburg,

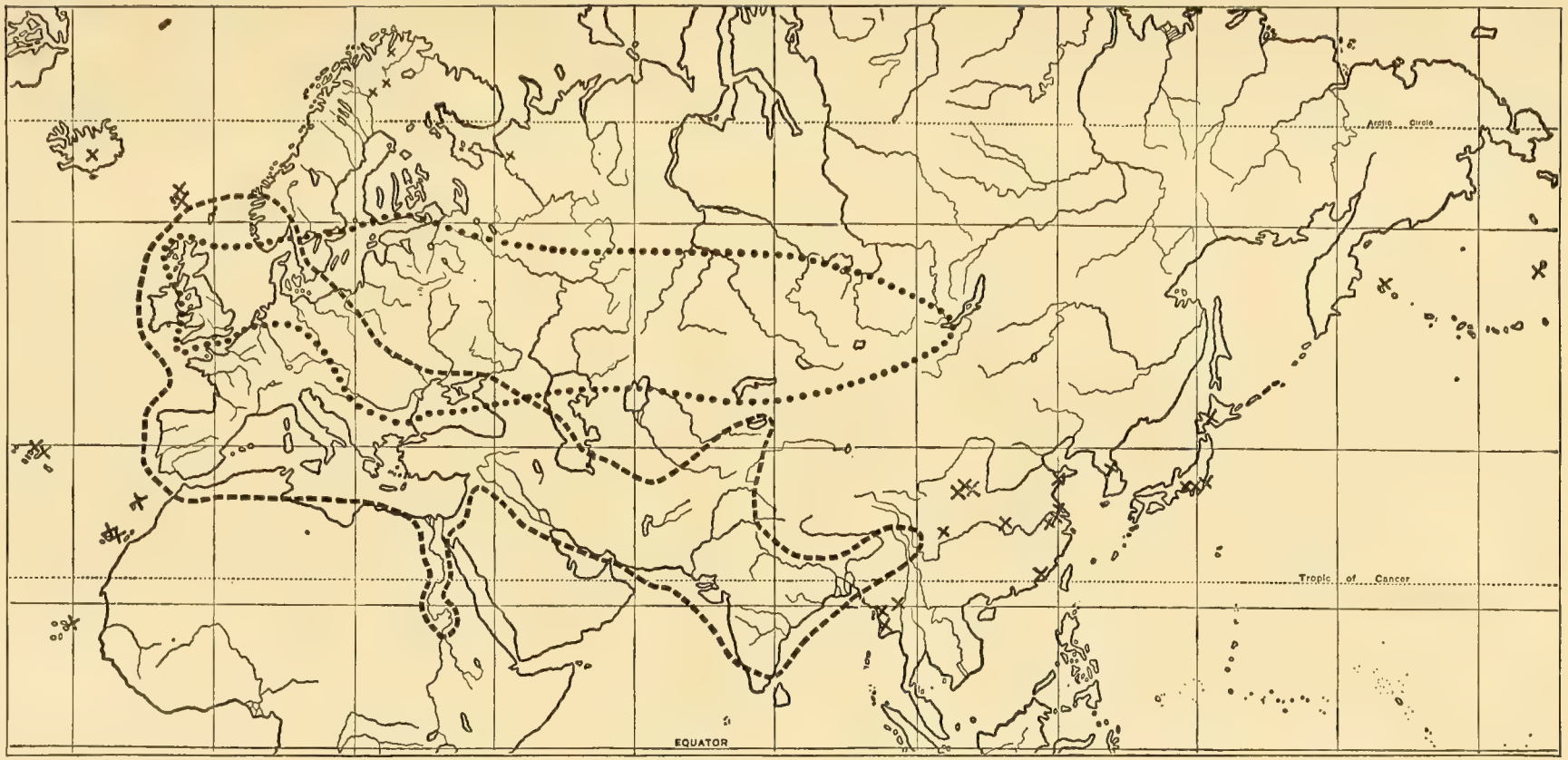
Germany eastern Prussia, Silesia, Saxony, Thuringia, Bavaria and Baden. To this may be added the records of von Homeyer (1872) for Pomerania, of Wüstnei (1902) for Mecklenburg, of Schalow (1915) for Brandenburg, of R. Blasius (1896) for Brunswick and of Hartert (1892) for eastern Prussia. According to Bünger (1900) and Hesse (1910) this duck has become very common as a nesting bird on the lakes about Berlin and Potsdam. There is no evidence of Pochards having ever bred in Switzerland, and the statements of older writers that it had nested in one or two localities in northern Italy seem to be very doubtful (Giglioli, 1886; Arrigoni degli Oddi, 1904).

An isolated nesting locality seems to be eastern Algeria, where Pochards breed abundantly on

Algeria Lake Fetzara (Zedlitz, 1914), and have been seen as late as May near Ain Dahlia (Menegaux, 1919) and as late as June at Lake Halloula (Tristram, 1860a).

Turning north again I find the Pochard recorded as breeding in Austria (Mojsisovics von Mojsvár, 1897), Czecho-Slovakia (Fritsch, 1872) and Hungary, where it nests commonly (von Mojsisovics,

Central Europe 1886; von Dalla-Torre and von Tschusi, 1885; Schenk, 1906, p. 202; Frivaldsky, Madarász, *fide* Millais, 1913). In Poland the species nests regularly and in tolerable numbers (Taczanowski, 1888; Katin, 1912), though in Kurland, Livonia and Esthonia it is a rare breeding bird (Loudon-Lisden, 1909). Nests have been found on the Aland Islands and there are a few even recent records of its breeding near Helsingfors (Palmén, 1876; Palmgren, 1913). Remarkable is



MAP 80. Distribution of Common Pochard (*Nyroca ferina*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

V. Wright's (*fide* Dresser, 1871–81) assertion that it occurs about Karesuando and Montell's (1917) statement that he found the species rare in May in the Enontekis-Muonio district of Finland (Lapland)!

In Russia proper the Pochard nests in many districts. It is rare in the Crimea (Radde, 1854) but breeds commonly in Ekaterinoslav (Valkh, 1911), Kief (Goebel, 1870), at Sarepta (Moeschler, 1853), Tula, Moscow (Menzbier, 1881; Poliakov, 1912), Kazan (Russki, 1893), Perm (*fide* Millais, 1913), Jaroslav (*ibid.*), Novgorod (Bianchi, 1910), near Riga (Sawitzky, 1899) and rarely about Petrograd (Büchner, 1885; Bianchi, 1907). Alston and Harvie-Brown (1873) state that the Museum of Archangel has a specimen presumably from that vicinity. **Russia**

Little is known as to the breeding status of this duck in the Balkans. It is fairly common and breeds in Transylvania (Danford and Harvie-Brown, 1875) and some were seen late in May in the Danube delta (von Almásy, 1898). Nests have also been found near Varna, and Dombrowski states that it breeds commonly in Rumania (Millais, 1913). It has been reported as probably breeding in Macedonia. **Balkan States**

Comparatively little is known of the breeding range of the Pochard in Asia. It is a common nesting species throughout the Kirgis region (Seebohm, 1882; Nazarow, 1887; Suschkin, 1914) but does not seem to breed in the Caucasus. There is no definite evidence of its nesting farther south, though some were seen late in April on the Tedshen River, Transcaspia, and it is said to be a rare resident at Seistan, in southeastern Persia (Cumming, 1905; Zarudny, 1911). Meinertzhagen (1920) states that specimens were seen in Baluchistan near Quetta in May, June and even July, though no nests were found. **Asia**

Northward, the breeding range extends over central Asia and the southern part of western Siberia. The species has been found breeding or in summer at Yarkand (Koslow, 1899), on the Ili River (Smallbones, 1906), on the Sassyk-kul and Ala-kul (Finsch, 1879), on the Saissan-nor and in the Russian Altai (Suschkin, 1913), near Akmolinsk (Bianchi, 1902a), on Lake Tschany (Slovzoff, *fide* Finsch, 1879), near Omsk (Poliakov, 1915), near Tomsk (P. and J. Zalesski, 1915) and near Tobolsk, where small numbers nest everywhere (Finsch, 1879; Ushakov, 1913). Eastward, the Pochard breeds near Minussinsk (Suschkin, 1913) and about the southwestern part of Lake Baikal (Radde, 1863). There is no good evidence of its having nested farther east. The male taken on Bering Island, May 13, 1911 (Hartert, 1920a) and the male taken on St. Paul Island in the Pribilov group, May 4, 1912 (Evermann, 1913), were undoubtedly isolated summer stragglers, while the records for northern Japan are mostly in autumn and winter.

Winter Range

The Pochard is a common winter bird throughout the British Isles, though the numbers seem to vary considerably in different years (H. Saunders, 1899; Millais, 1913; G. R. Gray, 1871; Ussher and Warren, 1900; and many others). The northern extent of the winter range in this region is probably the Shetland Islands, where the species is very irregular in its occurrence (Saxby, 1874; A. H. Evans and Buckley, 1899). **British Isles**

On the Continent this duck winters in small numbers on the western and southern coasts of the Scandinavian peninsula, in Norway generally from Christiansand to Stavanger, though specimens have been taken at Bergen and once, October, 1873, on Varangerfjord (Wallengren, 1854; Dresser, 1871–81; Nilsson, 1858; Schaanning, 1913). It is also found in Denmark during the cold season (Helms, 1905; "G. L.," 1918). It is said to be very common in Schleswig-Holstein in winter (Bau, Blasius, Reichenow and Schalow, 1877) and is generally found throughout Germany in small numbers and in suitable localities (Naumann, 1896–1905; *et al.*). It is a cold-weather visitor in Holland (Dresser, 1871–81), Belgium (Dubois, 1886) and, I imagine, along the northern coast of France. In some winters a few stay in central France (Delmas, 1912; des Prugnes, 1912) and many pass the cold season in Provence (Lilford, 1875; l'Hermitte, 1916). **Western Europe**

The Pochard is a fairly common winter bird in the coastal regions of Spain and Portugal. Irby (1883) states that he saw a flock at Santander on December 14, while in Portugal it is common at Murtoza and Esmoriz (Tait, 1896) and occurs also at Montemar and Lagoa de Albofeira (de Seabra, 1910). In Spain small numbers winter on the *marismas* below Seville (Irby, 1875; A. Chapman, 1888), while on the east it is quite abundant at Malaga, Valencia and Gerona (Arévalo y Baca, 1887). It has also been recorded from Majorca (Munn, 1921).

The Pochard has been taken at one time or another on many of the Atlantic islands. In the Ponta Delgada Museum, Azores, there is a pair taken on San Miguel (Hartert and Ogilvie-Grant, 1905).

Atlantic Islands

A specimen was taken on November 28, 1903, on Madeira (E. Schmitz, 1907) and it has occurred at least twice on the Canaries (Meade-Waldo, 1893; Koenig, 1890). The southernmost record is probably that of a specimen taken December 2, 1898, on São Nicolão Island in the Cape Verde group (Salvadori, 1899).

Northwest Africa

On the mainland of northwestern Africa this duck winters not uncommonly in Morocco (Irby, 1875; J. I. S. Whitaker, 1905) and apparently quite abundantly in parts of Algeria, such as Oran (Millais, 1913), El Baheira and Zana (Salvin, 1859), Tuggurt (Tristram, 1860) and Lake Fetzara (Rothschild and Hartert, 1912). In Tunis it is less common, though it has been recorded from Bizerta, Sfax and Gabes (J. I. S. Whitaker, 1905; Millet-Horsin, 1912; Bédé, 1915).

On the European side of the Mediterranean the Pochard winters commonly in Sardinia (Salvadori, 1865; Brooke, 1873) and in Corsica (Jourdain, 1912), though it appears to be quite rare in Malta (Despott, 1917). In Sicily and throughout Italy it is an abundant species during the cold season (Giglioli, 1886, 1889–91; Arrigoni degli Oddi, 1904) and many are found on the lakes of northern Switzerland (Fatio, 1904). No doubt some of these birds pass the winter in the Succession States of the Austrian Monarchy, but there is no evidence to substantiate this, beyond Kolombatovič's (1903) statement that the species is common in winter in Dalmatia and Reiser and von Führer's (1896) testimony that it winters in Montenegro. It is an abundant cold-weather visitor in the Ionian Islands (Powys, 1860) and in Greece (Lindermayer, 1860; and others). Chasen (1921) found it common in the Struma valley in winter, though in Bulgaria it seems to be rare (Alléon, 1886). Presumably some winter in Rumania and on the Black Sea littoral of Russia, for Kennedy (1921) found it fairly common at Novorossisk, near the Straits of Kertsch, and it is an abundant bird at Tiflis and Lenkoran in the Caucasus (Radde, 1884).

Southern Europe

In Egypt the Pochard winters in large numbers in the Delta, along the Nile and on suitable lakes, extending south through Nubia and rarely to the Sudan, two specimens having been taken near Khartum (Shelley, 1872; von Heuglin, 1873; Cecil, 1904; Whymper, 1909; Nicoll, 1919; W. L. Sclater and Mackworth-Praed, 1920). Tristram (1884) describes it as the commonest duck in winter in Palestine, whence it has also been reported by Hart (1891) and Meinertzhagen (1920). In Cyprus it is fairly common (Bucknill, 1910). Weigold (1913) states that incredibly large numbers winter in northern Asia Minor and that some were seen on the Meander plain. Flora Russell (1912) found the species very common near Sardis, and Dresser (1891) has recorded it from Erzerum. In Mesopotamia it was common in January (Meinertzhagen, 1914), though in February and March only a few were to be seen (T. R. L., 1918). Stantschinsky (1914) considered it the commonest diving duck in eastern Transcaucasia, while Radde (1886) and Radde and Walter (1889) as well as Zarudny (1911) state that the species winters on the southern and southeastern Caspian littoral. From the interior there are records of individuals seen near Askhabad in December and January (Stolzmann, 1893) and small numbers seen late in February on the Tedshen River, Transcaspia (Loudon, 1910). In Persia it seems to be rare excepting in the northwestern parts. It was found at Seistan in December (Baker, 1919). It occurs in southern Baluchistan (Zarudny, 1911) and is very common at Quetta (Meinertzhagen, 1920). O. B. St. John (1889) speaks of it as rare in southern Afghanistan, yet at Kohat and Kurran it was very common according to C. H. T. Whitehead (1909). Even farther north, in western Turkestan (Lansdell, 1885; Severtzoff, 1883) and on the Issyk-kul, the Pochard has been found wintering.

Egypt

Palestine

Mesopotamia

Asia

In Kashmir the species seems to be quite rare, and has only been recorded on two occasions (Baker, 1921); but in India proper it is common enough throughout the northern part, growing less frequent toward the middle of the peninsula. Hume and Marshall (1879) describe it as rare in Hyderabad, Khandesh, Berar, Guzerat, Cutch, Kathiawar, the southern parts of the Central Provinces and the northern parts of the Madras Presidency. In their day the southernmost record was for Bellary, but since then specimens have been procured in Mysore and Bangalore (Baker, 1921). To the eastward the winter range extends to Manipur and Sadiya; it is fairly common in Cachar and Sylhet and probably in northern Burma, and has been reported from Bhamo, Mandalay, and Arakan (Baker, 1921).

India

From the very meager evidence available I should say that it is not a common bird in China, at least in the south. David and Oustalet (1877) say it is widely distributed, but not that it is common, as Dresser (1871–81) seems to think. The only records I can find are the following: one taken near Kiating, Szechwan, November 22 (Thayer and Bangs, 1912), two in the Shasi market, Hupeh, in February (La Touche, 1922), and one at Foochow (La Touche, 1892). Styan (1891) states that it is found sparingly on the lower Yangtse and von Heuglin (1874a) has recorded it from Shanghai. Kleinschmidt (1913) includes it in his list of the birds of Kiao-chow. Sowerby (1912) says it is the commonest duck on the borders of Shensi and Kansu, but does not state at what time of year. Mr. Kuroda writes me that it is a rare duck on the coasts of China.

China

Japan

The Pochard is included in Kuroda's (1918) list of the birds of Korea, and was found common at Yokohama by Blakiston and Pryer (1882). As to its further status in Japan I can quote Mr. Kuroda's letter. He says it is a rare duck and a winter visitor north as far as Hokkaido (Yezo), Hondo and south to Shikoku, Kiusiu and also to Korea. Seebohm (1892) seemed not to be certain whether the bird was a resident or only a winter resident, but the breeding range is probably far to the westward of Japan.

Migration

Since the seasonal movements of the Pochard present no particular characteristics, it may suffice to enumerate a number of representative dates. Those birds that do not stay to breed, leave northern Africa usually in March (J. I. S. Whitaker, 1905), though some linger till April or even May in Morocco (Favier, *fide* Irby, 1875). They pass over Corsica late in February or early in March (J. Whitehead, 1885), over Spain late in February (Arévalo y Baca, 1887), over Portugal in March (de Seabra, 1910), through Italy late in February or early in March (Giglioli, 1886; Arrigoni degli Oddi, 1904), through Hungary (average arrival 1895–1911) about March 14 (Lambrecht, 1912), and through Switzerland in March (Fatio, 1904), arriving in Germany in March (Naumann, 1896–1905) and in Denmark early in April (Collin, *fide* Dresser, 1871–81; Helms, 1905). Farther eastward the migration is somewhat later, dates of arrival being: Kief, March 15–April 15 (Goebel, 1871); Moscow, early April (Lorenz, 1892); Pskof, early April (Zarudny, 1910); Baltic Provinces, early April (Loudon, 1909); Petrograd, April (Bianchi, 1907); Poland, early April (Taczanowski, 1888).

The autumn-migration dates for Europe are: Denmark, October and November (Collin, *fide* Dresser, 1871–81); Germany, early October to middle of November (Naumann, 1896–1905); Bohemia, October and November (Fritsch, 1872); Switzerland, late October and November (Fatio, 1904); France, late October (Degland and Gerbe, 1867); Italy, September to November (Giglioli, 1886); Portugal, December (de Seabra, 1910); Spain, November (Arévalo y Baca, 1887); Morocco, October (Favier, *fide* Irby, 1875); Tunis, October and November (J. I. S. Whitaker, 1905). In Russia they stay near Petrograd till November (Bianchi, 1907); they leave the Baltic Provinces by November 1 (Loudon, 1909); Pskof, late September (Zarudny, 1910); Moscow, late September (Lorenz, 1892); Kief, October 15 to November 1 (Goebel, 1871). Birds that winter in the British Isles arrive there in October and November.

In regard to the migration in Asia our information is very meager. The only spring dates I can give are these: leave Lenkoran by the middle or end of February (Radde, 1884); passed Derbent Light, West Caspian, March 19 to April 1 (E. von Middendorff, 1891); Zarafshan Basin, great migration about the middle of March (Carruthers, 1910); passed through Buchara in March, and through Ferghana in April (Loudon, 1910); first arrive at Omsk on May 9 (Poliakov, 1915); passed Koko-nor in March and north bend of the Hoangho in April (Prjevalski, 1878). I can find nothing concerning the autumn migration in Asia beyond Radde's (1884) statement that they reach Lenkoran in late November, and the testimony of Hume and Marshall (1879), Baker (1921) and other naturalists in India that they arrive in that country during the end of October and in November.

Preponderance of Males

With many ducks there is a preponderance of males in the northern part of the wintering area, which is usually accounted for by the fact that the older males remain farther north. This theory will not account for the great excess of male Pochards in many parts of its wintering range, and, it seems, on its breeding grounds also. The scarcity of females and young in comparison with adult males both in the breeding season and in winter is attested to by many English writers (Payne-Gallwey, 1882; Cordeaux, 1896; Ussher and Warren, 1900; Millais, 1913). Helms (1905) speaks of a flock of four hundred Pochards seen in Denmark in December, three-quarters of which were males, while Weigold (1913) says hundreds of *males* winter in northern Asia Minor, and Radde (1884) states that in the market at Tiflis and at Lenkoran almost all the Pochards seen are males. It would be interesting to know whether this disparity in numbers of the sexes holds for India also. This preponderance of males is seen in several species of northern diving ducks.

GENERAL HABITS

The European Pochard may be taken as an example of a typical diving duck. It has been placed by many writers very close to our Red-head but it is just as correct to place it close to the Canvas-back. The Pochard group (Pochard, Red-head and Canvas-back) are closely related in appearance, habits, display positions, and coloring of downy young. The Ring-necked Duck, so often included among the Scaups, should really be placed among the true Pochards or follow immediately after them. As Allan Brooks has shown, the Common Pochard is about intermediate between the American Red-head and the Canvas-back. Particularly striking is the contour of the forehead and culmen as you see the three species swimming together in a collection of water-fowl. The present species has a distinctly "Canvas-back look" in the long sloping forehead and longer, straighter bill, in sharp contrast to the squarer "facial angle" of our Red-head.

In contrast to the Common Scaup, the Pochard is a true fresh-water duck, fond of large lakes or brackish lagoons, and prefers waters of moderate depth, from three to eight feet. When found on salt water, it is usually because of being driven thither for refuge during part of the day. The same is true of our American Red-heads and Canvas-backs, which make daily flights to the ocean wherever their day feeding grounds are heavily shot or otherwise disturbed.

In the nesting season Pochards occupy sheets of water surrounded by reeds or other dense vegetation and like many other species are fond of islands.

On the water the old males can hardly be confused with any other species except possibly the Red-crested Pochard and in poor light with the Widgeon. The females and young are, however, inconspicuous, and at long ranges it is easy to confuse them with Scaups, White-eyed Ducks, Tufted Ducks and perhaps even Golden-eyes.

Wariness. The Pochard cannot be considered as wild by nature, especially as compared with many of the surface-feeding ducks. All species of diving ducks are inclined to trust to their swimming and diving powers and hesitate to jump at the first alarm. When undisturbed, newly arrived birds, such as Hume and Marshall (1879) describe in India, sometimes pay very little attention to a boat, and flocks of several thousands may at first be approached to within thirty yards. One of these great flocks, Hume says, "seemed to take no notice of us; and, when I halted the boat and we all remained perfectly still in it, they closed in again, so that scores were swimming within twenty yards of us, and many dived under us and popped up here, there, and everywhere within a few yards, disappearing under water, however, again instantly, as soon as they perceived how close they were." Probably few sportsmen at the present day have seen Pochards behave so confidingly except in sanctuaries. Ordinarily they are by no means easy to approach with a gunning-punt on larger waters, though it is sometimes easy to sail down-wind upon them. When paddled up to they swim scattered before the punt for a considerable distance before taking wing. Puntsmen usually alarm them sufficiently to make them crowd on the water before flying. Single birds or small parties are apt to be much less wary and may be easily approached. No doubt Pochards would show just as little discrimination in approaching wooden decoys as do our Red-head and Canvas-back. The ease with which this duck was taken in the standing nets of the Essex decoys and flight ponds shows that it cannot be rated very high in brain capacity.

Daily Movements. Pochards prefer to feed by day, but if hard pressed in the winter quarters they will do a certain amount of feeding both at night and during the very early hours of the morning.

When undisturbed they will rest during the mid-day hours, procuring most of their food in the morning and evening. Like other ducks they make regular evening flights from the daytime refuges to the more exposed places where they can feed under cover of darkness. Some writers maintain that they prefer to feed by night. This may be true on bright moonlight nights when all fowl are fond of feeding, but it is not certain whether they really feed as well during actual darkness. In certain places, at least, our Red-heads do not appear to attempt night feeding and the stomachs of those shot early in the morning are empty.

Gait, Swimming, Diving. Like other Pochards and Scaups they walk slowly

and awkwardly; when hurried they frequently fall and are soon exhausted. They are evidently ill adapted to feeding on land and are seldom seen ashore. When standing still they hold the body in a more vertical position than in any of the surface-feeding ducks, but when they are walking the body is more horizontal, though the gait is rolling and clumsy.

Most pictures of swimming Pochards show the bird riding like a cork, with the tail above the water and the breast well exposed. It is true that at times they do float rather lightly, but generally the body is low, the tail dragging on or in the water; when frightened or in play the forward part of the mantle may be level with the surface, or even submerged. The artist draws the profile of diving ducks more with the idea of representing the plumage than of showing the characteristic swimming attitude.

This bird is an active diver, and although it feeds in waters of very moderate depths, so that it does not have to stay under more than one-half to one minute, it seems able in exceptional cases to stay under a longer time, possibly up to three minutes (Naumann, 1896–1905), although I feel very doubtful about such long periods. J. M. Dewar (1924) in his book on the diving habits of various birds has shown the Pochard's preference for shallow waters; indeed, the optimum depth of those he studied was only three feet, the greatest depth eight feet and the longest dive only twenty-five seconds. The vegetable food is swallowed beneath the surface, but small fish are sometimes brought to the surface according to Millais (1913). I have observed this with Red-heads and Scaups in confinement. When feeding on rich bottom they usually reappear at the same place from which they dived. They do not ordinarily use their wings under water, although it would not be safe to assert that they "never" do so, for we now know that many diving birds which were supposed never to use their wings in the water do so at times. Pochards and other ducks make use of their wings under water to escape when wounded.

Flight. In flight the sharp, pointed wings are moved rapidly, producing a more or less characteristic sound, rather rustling than whistling in its nature. Like other fuliguline ducks, when disturbed, they do not take wing immediately, but swim a short distance, huddle together, and when further alarmed, rise head to the wind and scurry along for a number of yards before clearing the surface. If the wind be strong they clear the water very quickly and, having risen ten or fifteen yards, swing away from the danger point. Like our American Red-heads, Pochards fly in compact flocks when going short distances or when close to the water, but when they have mounted out of gunshot or are crossing dangerous ground these flocks thin out into long wavering lines, blunt wedges or even V-shapes. Like our Red-heads, too, they sometimes come out of the air at an abrupt angle, cutting down to the water at such a tremendous speed that the stiffened wings produce a loud humming sound.

It is difficult to distinguish Pochards from Tufted Ducks or White-eyes on the wing when the colors cannot be seen. The finer distinctions between diving ducks which often enable the fowler to put to shame the ornithologist, are mostly beyond description, and are learned by long experience in the field rather than from books. With a good glass it is easy enough to tell the different species on the water, especially males, at long distances, but when the birds are on the wing it is a very different matter. The presence of a thick head, short neck and stumpy tail and the absence of white wing-bars are good characters in flight. If you can see the reddish heads and black breasts of the males they are unmistakable.

The size of the flocks depends entirely on the abundance of the bird, the time of year and the weather conditions. It is their habit to gather into enormous flocks at favorite feeding grounds, and aggregations numbering thousands are not uncommon in parts of the winter range.

Association with other Species. Pochards associate freely with other diving ducks, particularly Scaups, White-eyes, Tufted Ducks, Red-crested Pochards and Golden-eyes. In the British Isles they nest in reed beds close to Tufted Ducks and among colonies of Black-headed Gulls.

Voice. There seems to have been much confusion in describing the Pochard's voice. Naumann (1896–1905) and others have described the male's note as a hoarse *charr charr charr* or *kurr kurr kurr*, the female's as similar but even more hoarse. If the male has any such note as this I certainly have never heard it from either captive Pochards or their near relatives, the American Red-heads. The male's note, which is a spring courtship call, perhaps also used in play, is a soft mewing sound, not, I should say, so loud or catlike as the corresponding note of the Red-head. This call, which Millais (1913) describes as "somewhat like a man affected with asthma who is told by the doctor to take a deep breath," is accompanied by a distention and "kinking" of the neck, and sometimes, but not always, by the extraordinary display to be discussed below. Many observers have spoken of a soft Widgeon-like whistle, also heard from the male, and made use of by punt-gunners in locating Pochards by night. I have never heard this note, which apparently carries only a very short distance. There may be other sounds uttered by the male, but I know nothing about them.

The call of the female is a harsh, chattering croak, almost if not quite identical with that of other female diving ducks, and frequently rendered by the syllable *kurr* several times repeated. The females are very noisy in spring or when they and their young are surprised. But in the winter quarters one may be among them for some time before hearing the note.

The trachea of the male is about eight inches (200 mm.) in length and almost uni-

form in width but tapering a bit toward the lower end. There is a moderate-sized, left-sided tracheal labyrinth composed of membranes supported by bony frames. There are two of these membranous surfaces on the left or outer and one on the right or inner side. This structure is almost the same as that of the Red-head and analogous to the Scaup's. It was first described by Latham and Romsey (1798).

Food. Pochards feed on vegetable matter when this is obtainable and sometimes, especially when driven to the seacoast, this diet is supplemented with shellfish. *Zostera*, however, does not seem to be a favorite food. They rely chiefly on roots and seed-pods of the various species of water-weeds (*Potamogeton*, *Myriophyllum*, *Ceratophyllum*, *Polygonum*), according to Naumann (1896–1905). In Upper India, Hume and Marshall (1879) found their winter food to be almost entirely vegetable and consisting of seeds, flower-buds, shoots, leaves, stems and roots of water-plants, together with fine pebbles and sand. They also found a few insects, grubs, worms, tiny frogs, and a good many shells in the stomachs. Naumann (1896–1905) also speaks of small fish, tender shells and perhaps occasionally small frogs as part of the diet in winter and spring. At times they tear up so many water-plants that they provide valuable food for both Mallard and Widgeon. They come readily to places which are artificially baited and in decoy-ponds they are sometimes a nuisance because they clean up the grain which is placed to decoy the Mallards and Teal into the pipes. Even when feeding with Scaups or Tufted Ducks in salt water, their stomachs are found to contain more vegetable matter than those of other species (W. Thompson, 1851). A specimen taken at Teneriffe, Canaries, in December, had the stomach filled with the larvæ of a species of dragon-fly (*Æschna*), according to Koenig (1890). Chara-weed is mentioned as a favorite food at times but this must, I think, be unusual. It is not especially attractive to diving ducks in this country.

Courtship and Nesting. The remarkable and spectacular display of the Pochard was never adequately described until 1913, when Millais published a plate and a detailed account of it. It is interesting at the start to remark that the display attitude is similar to that of the American Red-head and the Canvas-back and evidently related to that of the Golden-eye. Often in the breeding season and usually in winter there is a marked preponderance of males in this species, though why this should be so no one has yet explained. A group of males is often seen displaying at the same moment, sometimes crowding around a single female, who, from time to time dips her bill into the water or stretches her neck out in front, uttering her hoarse calls, which sound like *kurr-kurr-kurr*. The males continually utter their mewing or groaning call already described. The commonest form of display consists in blowing the neck out with air, with the head raised horizontally, uttering the groan as the air is re-

leased, or perhaps just before it; I am not sure which. One may watch Pochards in courtship for a long time without seeing anything else, but the most interesting part of the performance is yet to be described. The male throws the head and neck suddenly back until the occiput touches the rump or back and then quickly snaps it forward into normal position again. During periods of greatest activity a male may repeat these antics every half minute or so. Millais noticed that at times the male lies very flat on the water and stretches the head and neck out to the fullest extent, at the same time blowing out the neck and frequently turning the head to one side so as to display its full beauty. He also thought that the pupil of the eye nearly disappeared during moments of greatest excitement, while the eye itself seemed to blaze a rich lacquer red. The best time to see the throw-back performance is early in the breeding season, in late March or April. It seems to be discontinued during the nesting season proper, but the mewing note and distended throat may be noticed throughout, perhaps until moulting actually begins.

The Pochard is a late nester, at least compared with the Mallard or the Pintail. In western Europe the month of May, particularly the middle and latter part, and early June, constitute the chief breeding period, though nests have been found both in England and in Germany as early as April 26 and 28. In southern Spain a nest was found on May 15 (H. Noble, 1902) and at Lake Fetzara, Algeria, most Pochards were laying late in May and early June (Zedlitz, 1914).

The commonest situation for the nest is on or near the edge of dense beds of dead standing flags, over mud or shallow water. In England Pochards are said to select situations where hundreds of Black-headed Gulls nest. Small islands are favorite sites but occasionally nests are located on firm ground ashore, in the middle of a clump of tall rushes (A. Chapman, 1912).

The nest itself is uniform and strangely resembles that of the Coot. It consists of a dense, bulky mass of dead flags roughly woven together a few inches above or even touching the surface of the water. It is usually so placed that it is completely covered by the vegetation and is well hidden. Ordinarily the nest is lined with down toward the end of the laying period. This down may be black, blackish or even brown, with small inconspicuous white or pale brownish-white centers (A. C. Jackson, 1918). In exceptional cases nests without nest-down have been found. H. Noble (1908) says that he has found nine different nests in Scotland presumably in late stages of incubation all of which were entirely without down. A. Chapman (1912) found nests with half-incubated eggs near the Scottish border which had no down.

Clutches vary in number from six to eleven eggs, the typical number being probably eight or nine. Exceptional clutches of thirteen or even fourteen eggs have been noted (Naumann, 1896–1905; Newton, in Dresser, 1871–81). These last were almost certainly the work of two females.

The eggs are not characteristic for the species and may be easily confused with those of the Scaup or Tufted Duck. They are dirty greenish or greenish gray in color, with a waxy surface. Sometimes they even have a yellowish tinge and after being blown the greenish tinge seems to disappear entirely. The average dimensions of 110 eggs were 61.4 by 43.7 mm., the maximum and minimum lengths being 68 and 57.2 mm., the maximum and minimum breadths 46.5 and 39.2 mm. (Hartert, 1920a). They can usually be distinguished from those of the Tufted Duck by the less greenish color and the greater size. Sometimes a few Pochard's eggs are deposited in the nest of the common White-eyed Duck.

The incubation period is twenty-two or twenty-three days, according to Naumann (1896–1905). Millais (1913) gives twenty-four days as the duration of incubation and this seems about right, judging it by other diving ducks. Among seven clutches of eggs hatched by Mr. Wormald the time varied from twenty-three to a little over twenty-five days. An interesting note on the behavior of a female Pochard going on to the nest is given by Mr. Gerald Legge and is quoted by Millais (1913). The bird in question was nesting in confinement and was observed from a distance of about a yard. "Soon she came and sat on the edge of the nest for two minutes, all the time keeping up a gentle crooning to herself. Then she settled down on the nest without uncovering the down from the eggs. After sitting for about one minute she turned half round, and with one leg pushed some of the covering of the eggs to the side and edge of the nest. She then made another half turn on the other side, and pushed more down on to the edge. Both times the movement was effected by stretching her leg out behind, with toes and webs spread."

The female is a very close sitter both in the wild and when breeding under artificial conditions. Incubating birds may be stroked or almost lifted from the nest by hand. The young leave the nest the day after hatching and slide directly into the water, where they immediately begin to feed on insects and small floating vegetation, such as duck-weed. Millais thinks that they begin to dive of their own accord when only a day or two old, but I know of no other observations on this point. The young of all diving ducks and even of surface-feeders are able to get under water at extremely early ages when alarmed but at exactly what age they begin to dive voluntarily in search of food I do not know.

Like the young of surface-feeders the ducklings of the Pochard and its relatives utter a peeping noise, which is their only call.

The male leaves the female soon after she begins to incubate and gradually withdraws from the neighborhood of the nest, just as most of the common surface-feeding ducks of northern regions do.

Status. It seems that in the early part of the last century, before the complete drainage of the fens, the Pochard was a common breeding bird in England, though

nothing definite seems to be known. Almost till the end of the past century it seems to have steadily decreased until about 1880 or 1890 it began to be recognized as increasing as a nesting bird, at least in Norfolk (Stevenson and Southwell, 1890). Through the prohibition of netting and the enforcement of the protective laws there has been an uninterrupted increase in breeding birds and a steady extension of the nesting range in the British Isles. Baxter and Rintoul (1922) think the colonization in Scotland has advanced from the southeast. In old times it received no consideration at the hands of decoymen, because the enormous numbers which came into some of the pools interfered with the taking of other ducks. Destructive methods of capture by flight-nets were brought into use and huge numbers were taken in this manner. Its irregularity as a winter visitor in the British Isles makes it difficult to estimate its numbers and determine whether there has been a recent change for better or worse. There is, however, reason to suppose that there was a considerable decrease during the past century.

There is also some evidence of local increase in breeding birds in Germany. At Potsdam, and in the vicinity, the number of nesting Pochards has grown till now they outnumber even the Mallard (Bünger, 1900).

In winter "immense" flocks visit the Venetian lagoons (Arrigoni degli Oddi, 1898) and in Algeria, Zedlitz (1914) says it is almost as common as the Marbled Duck on Lake Fetzara during the breeding season. The native Arabs in this region are said to plunder the eggs. In Palestine, Tristram (1884) considered it the most abundant duck, perhaps exceeding in numbers all the other ducks combined. On the larger *jheels* of India where there are open expanses of water of some depth the Pochard still winters in enormous numbers (Baker, 1921). No doubt war conditions and especially lack of powder in Russia may greatly favor an increase of ducks and other game at the present time, but these conditions will not last. The Pochard is not a far-northern nester and so comes more and more into competition with improved agriculture, drainage and dense populations.

Enemies. Most destructive to the eggs of Pochards and other ducks in England and on the Continent are the Magpies, Hooded and Carrion or Common Crows. Large pike are said to kill the ducklings in some numbers, while rats and other ground vermin account for a good many. The usual birds of prey (Peregrine Falcon and hawks) occasionally attack Pochards successfully if these are not near enough to the water to dive; the Kite is said to prey very much on the young (Millais, 1913; Naumann, 1896–1905).

A number of species of parasitic insects and intestinal worms that have been found on the Pochard are listed by Naumann.

Damage. None of the diving ducks feeds on land and consequently they can very seldom do damage to crops.

Food Value. The Pochard is generally considered one of the best European ducks and has often been compared to our own Canvas-back. When shot on good feeding ground it resembles our Canvas-back and Red-head. But in localities where it feeds on animal matter and in salt bays or waters it becomes, like its American relatives, rank and unpalatable. By and large it is certainly the best of the European diving ducks for the table, and even Leonhard Baldner of Strassburg, writing in 1653, says that they eat few fishes, feed upon roots and are "counted as good as Mallards for meat."

Hunt. As before remarked the old-time decoymen did not like the Pochards in their ponds because they disturbed other ducks and were very hard to take in the pipes. Besides this they ate food placed for Mallard and Teal and by their presence kept these ducks away from the entrance to the pipes. Consequently the decoymen developed a system of standing nets and "flight-ponds" described in the fifteenth and sixteenth chapters of Folkard (1859) and again referred to by MacPherson (1897). This method of taking Pochards apparently originated in the county of Essex, but was not invented until long after the decoys themselves. Sometimes the flight-net was erected beside a well-known decoy but the two methods did not always work well together because the ordinary ducks work best in a well-sheltered decoy whereas the flight-pond should be at least partly open, and not surrounded by high trees. The more elaborate flight-ponds were arranged so that nets could be erected at any side, according to the wind and the direction taken by the birds on leaving the water. These nets were stretched on poles sixty feet in height and so arranged with a complicated system of pivots, weights and pulleys that they could be lowered and sprung with speed and safety. The actual dimensions of the nets were 50 yards long by 18 yards in height and the mesh was three inches. The space on which the nets were worked, was called the Dun-bird Yard and there were pens under the net to catch and hold the fallen birds. The nets were not sprung until the ducks had started from the pond and indeed the first of a flight were often allowed to pass over the yard before the net was sprung. Folkard speaks of such great flights striking the nets of Essex flight-ponds that these were borne down to the ground. From five to six hundred of these duck at one "drop" was not considered unusual and on one occasion a wagon and four horses were required to take away the spoil!

Ducks are said to be still taken in Holland with the standing net and a cruder form of upright net is still used in various parts of the world, Scandinavia, Greece, Russia, India, and even Japan. Sunken nets are also employed at times to take various species of diving ducks.

Pochards are hunted in the British Islands with the punt-gun, but apparently very large bags were never easy to make. Payne-Gallwey gives some account of the difficulty of approaching Pochards with a swivel-gun and the reasons why they seldom

presented a good target. He says that the best chance is to put the flock up once you are near enough and then take them when they rise. Sometimes Pochards can be sailed upon down-wind and good shots obtained. Millais speaks of this method in England and Hume used it in India. They are also taken by flight-shooting at dusk or by driving them out of a favorite pond and posting guns to intercept them on their return.

Behavior in Captivity. Pochards are among the easiest of the diving ducks to keep under artificial conditions. They become adapted to grain diet very readily, are hardy, and soon become tame. Wild specimens are not easily induced to breed, but once a hand-reared stock has been developed the problem becomes a comparatively easy one. Among Mr. Wormald's splendid collection of breeding water-fowl in Norfolk in the spring of 1922, the Pochard was well represented. Like most of his ducks they were extremely tame, noisy and demonstrative, and so oblivious of the presence of a stranger that they would dive for food almost at one's feet. The females were nesting all over a boggy piece of land close to the pond and would allow one to stroke them or even to lift them partly from the nest. Mr. Wormald told me that one year he had eight females nesting and only five males for them to mate with. In spite of this the eggs of all the females were fertile, which shows that under certain conditions polygamy may take place. Nevertheless, polygamous tendencies are certainly rarer among diving ducks in captivity than they are among the commoner surface-feeders, such as the Mallard and Carolina Duck.

Among Mr. Wormald's stock the earliest date of egg-laying was April 23, which is somewhat later than the dates for the White-eyed Pochard but considerably earlier than those for the Tufted Duck.

Unlike some other diving ducks all or nearly all Pochards breed during their first spring. This is certainly not the case with *all* Tufted Ducks, Red-crested Pochards or Rosy-bills.

Pochards have always been kept in collections of water-fowl and appear in the earliest lists of the London Zoölogical Gardens. Although they do not seem to have bred there, they have done so at Knowsley and in Kew Gardens, as well as on the ponds of many leading English water-fowl fanciers.

Wild-caught birds used to be sold in England for £1 to £1 10*s*. the pair (Hubbard, 1907). The present price for good hand-reared stock is £3 the pair, and for wild-caught birds a little over £2. Here in America they are not often offered for sale and even in pre-war days would bring as high as $25.00 the pair, though this was probably top price. The New York Zoölogical Society has procured them for as little as $5.00 each.

As a rule Pochards live longer in captivity than other diving ducks. Twenty-one specimens in the London Gardens lived on the average five years, the maximum

being 14 years and 5 months (P. C. Mitchell, 1911). J. H. Gurney (1899) mentions specimens which lived 13, 17, and even 20 years, and Schmidt (1878) records one that lived 10 years and 6 months in the Frankfurt Gardens. Rogeron (1903) says that he kept a specimen twenty years though he had wounded and caught it when already adult, and even at this great age its life ended by an accident.

Usually diving ducks are not so long-lived as surface-feeders and unless the conditions under which they are kept are exceptionally good most of them will die after two or three years. In the Calcutta Gardens, Sányál (1892) says they did not do at all well, and in the Cairo Gardens, Flower (1910) had the same experience, though one specimen lived 4 years, 6 months.

Hybrids. In the wild state the Pochard not infrequently crosses with the White-eye (*Nyroca nyroca*), the result being the so-called Paget's Pochard, long regarded by some as a separate species. In addition wild crosses have been recorded between the Pochard and the Tufted Duck (*Nyroca fuligula*), the Scaup (*Nyroca marila*), the Golden-eye (*Bucephala clangula*), the European Teal (*Anas crecca*) and the Pintail (*Anas acuta*). In confinement the Pochard has been crossed with the Red-crested Pochard (*Netta rufina*), the Common Sheldrake (*Tadorna tadorna*), the Mallard (*Anas boschas*) and the Carolina Duck (*Lampronessa sponsa*), — (Suchetet, 1896; Poll, 1911; Millais, 1913; H. Wormald, *in litt.*; etc.).

As to the fertility of crosses with this duck very few actual breeding tests are on record. Examination of the germ cells in hybrids with the Tufted Duck show them to be fully developed, and probably fertile (Poll, 1911). It is more than probable that crosses between the Pochard, Red-head and Canvas-back will all prove fertile but much less work has been done with this group than with the surface-feeding ducks.

RED-HEAD

NYROCA AMERICANA (EYTON)

(Plates 45, 56, 57, 59)

SYNONYMY

Anas ferina Gmelin, Linné's Systema Naturæ, vol. 1, pt. 2, p. 530, 1789 (in part).

Fuligula ferina Bonaparte (*nec* Linné), Ann. Lyceum Nat. Hist. New York, vol. 2, p. 392, 1826.

Fuligula americana Eyton, Monograph Anatidæ, p. 155, 1838.

Nyroca americana G. R. Gray, Genera Birds, vol. 3, p. 621, 1844.

Nyroca ferina Woodhouse in Sitgreave's Rept., p. 104, 1853.

Aythya ferina, d. *americana* Bonaparte, Comptes Rend. Acad. Sci. Paris, vol. 43, p. 651, 1856.

Aythya americana Baird, Birds No. Amer., p. 793, 1858.

Æthyia americana Dresser, Ibis, ser. 2, vol. 2, p. 43, 1866.

Fuligula ferina, var. *americana* Coues, Key N. Amer. Birds, p. 289, 1872.

Fulix ferina americana Coues, Key N. Amer. Birds, ed. 2, p. 702, 1884.

Nyroca ferina americana Hartert, Vögel Paläark. Fauna, vol. 2, p. 1337, 1920.

VERNACULAR NAMES

English: Red-head, American Pochard, Red-headed Broadbill, Raft Duck, Red-headed Raft Duck, Washington Canvas-back, Grayback, Fall Duck, Fool Duck.

German: Rotkopf, Amerikanische Tafelente.

French: Milouin à tête rousse, Canard milouin, Dos gris, Canard violon.

Mexican: Coacoxtli, Coacostle.

Montana Indians: No-so-shi-ne.

DESCRIPTION

ADULT MALE: Similar to the European Pochard (*Nyroca ferina*) but the red of the head is glossed with coppery reflections, especially on the back of the head and around the upper neck. The abdomen is lighter colored and not so much vermiculated. The long scapulars are darker as well as the posterior part of the mantle region.

Iris bright red in spring, reddish yellow at other times. Bill pale, almost sky-blue with the tip black. Legs and feet bluish slate-color.

Wing 230–242 mm.; bill 45–49; tarsus 40–43.

Weight 2 pounds, 8 ounces to 3 pounds (1.13 to 1.30 kilograms) (latter weight at Swan Isle, North Carolina, 1921). One Massachusetts bird which I weighed in 1919 was 2 pounds, 15 ounces (1.27 kilograms), and one shot in North Carolina (Pea Isle), in December, went to just a trifle over 3 pounds. Average weight of 36 December males at Pea Isle was 2 pounds, 10 ounces (1.19 kilograms).

Adult Female: In general appearance like the female of the Pochard but the feathers of the scapular region lack vermiculations, being dark brown, tipped with grayish or brownish. The head is very much like that of the European species but the lower surface is lighter colored, particularly the lower abdomen. There appears to be a tendency to albinism among female Red-heads.

Iris yellow to hazel-brown. Bill blue except the tip, which is black. Legs and feet bluish slate-color.

Wing 210–230 mm.; bill 45; tarsus 39.

Weight 2 pounds to 2 pounds, 9 ounces (0.90 to 1.16 kilograms). Average weight of December birds at Pea Isle, North Carolina, was 2 pounds, 4 ounces (1.02 kilograms).

Young Female in First (Juvenal) Plumage: Resembles the adult female, but the feathers of the mantle and scapulars lack the well-defined light edges, while the abdomen is streaked and mottled with brown; never silvery white. Some of the tail-feathers are usually blunt at the tips.

Young Male in First Plumage: Very much like the female except that the head is always darker and richer in color, and by autumn is distinctly red. The iris is a brighter yellow. Very early in the autumn (September) a few vermiculated feathers appear on the mantle or scapulars. At the same time, or a little later, black begins to show on the upper breast and around the lower neck, while the mantle still remains as in the young female. The plumage is nearly complete by January.

Male in Eclipse Plumage: The head loses most of its full rich red and becomes dull grayish brown, while the vermiculated scapulars and flanks are filled in with dull-brown feathers, until little or no vermiculation is left. The jet-black mantle and breast are mixed with brown and lose their luster.

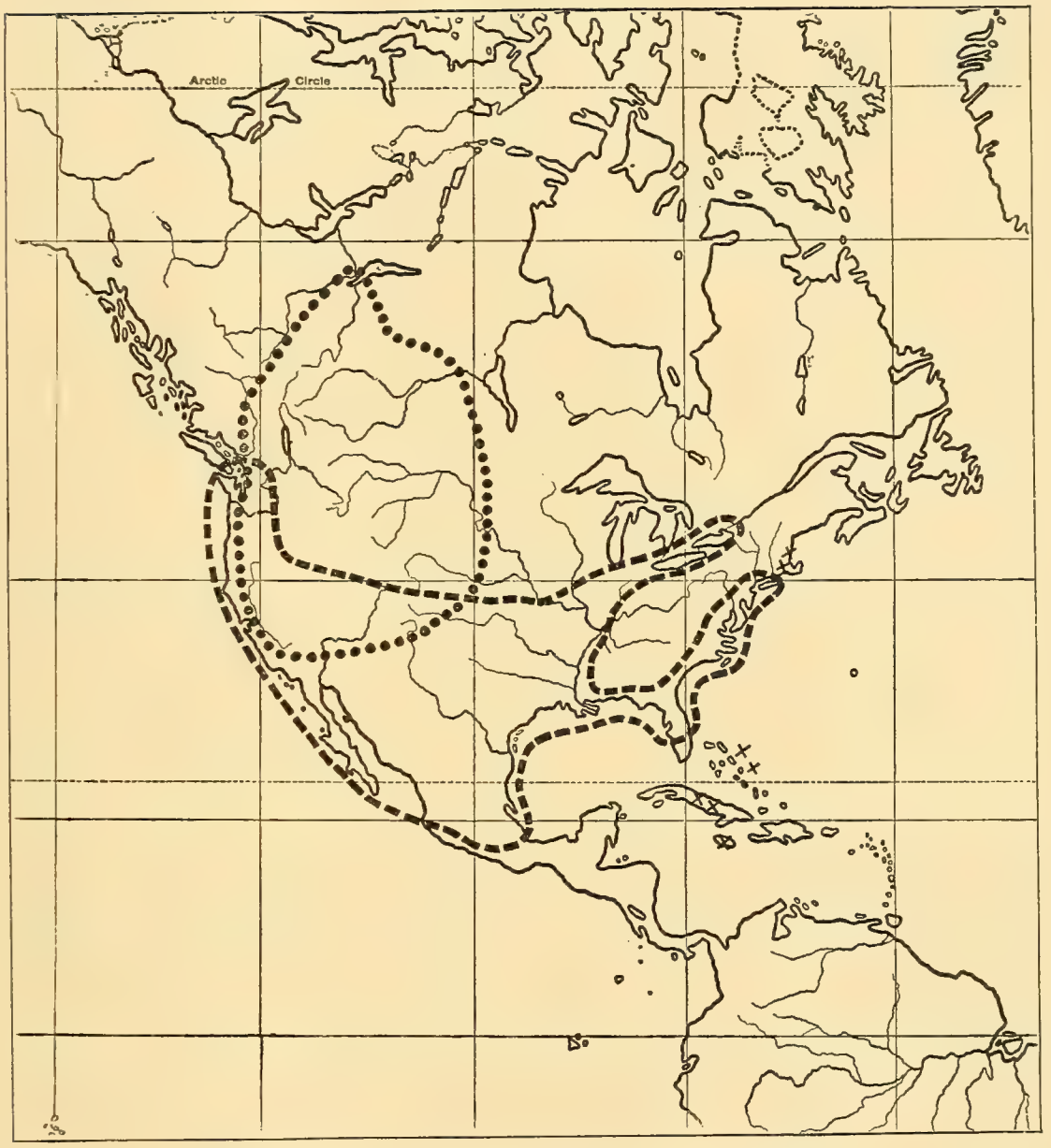
Young in Down (see Plate 59): Like the young of the European Pochard, light sulphur yellow below and yellow-brown on the upper surface. Face markings and orbital streak lacking, and the usual scapular-, wing-, and rump-patches just barely visible.

Note: The young male probably never arrives at his most perfect state of plumage the first spring. The most perfect specimens show very richly colored heads and very black breasts, sharply defined from the white of the abdomen.

DISTRIBUTION

The Red-head is one of the most popular and one of the best known of American ducks, though it has a comparatively restricted range. The breeding area includes the northwestern part of the United States and the southwestern part of Canada. A stray specimen taken on Kodiak Island is the only instance of its occurrence in Alaska (Cooke, 1906). In Canada the northern limit of the breeding range appears to be Lake Athabasca, at the western end of which Harper (MS.) noted the species in small numbers in May and June, 1920. The U.S. Biological Survey and the Museum of Comparative Zoölogy have specimens taken at Fort Chipewyan. R. MacFarlane (1908), however, states that a trader, B. R. Ross, saw a few Red-heads at Fort Resolution, Great Slave Lake, where he also secured a nest and eggs! Commonly the species breeds only in southern Saskatchewan, where it has been taken in summer or nesting at Prince Albert (Ferry, 1910), about Cumberland House and at the Pas (R. MacFarlane, 1908), at Chemawawin (*fide* Preble, 1902) and especially in the southwest (Bent, 1907). As to its present breeding status in Manitoba there is little to say, but it used to be very common there in the nesting season, especially in the western parts (Seton, 1886; E. E. Thompson, 1891). The species undoubtedly nests all over the southern half of Alberta as far north as Buffalo Lake (C. B. Horsbrugh, 1915) and rarely at Edmonton (Soper, 1918; Wolfe, *in litt.*). Mr. Brooks writes me that he found it had bred at a lake near Andrew, Alberta, in

Western Canada



MAP 81. Distribution of Red-head (*Nyroca americana*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

1909. In British Columbia the breeding range includes suitable localities in the southern parts, as far north as Okanagan, Lake La Hache and Cariboo Road (Kermode, 1904; Cooke, 1906; A. Brooks, *in verbis*).

On our Pacific Coast the Red-head nests commonly in Washington east of the Cascades, near Spokane (Johnson, 1906) and especially at Moses Lake (W. L. Dawson and Bowles, 1909), in central and southern Oregon (Walker, 1917) about Lakes Klamath and Tule (H. C. Bryant, 1914) and at Malheur Lake (Willett, 1919). In California nests have been found in suitable localities throughout the State, south even to Los Angeles and Ventura Counties (Grinnell, Bryant and Storer, 1918). Eastward it is said by Cooke (1906) to breed at Ruby Lake (Nevada), and Snyder (1900) has recorded its doing so at Hoodoo Lake, Idaho. (See also U.S. Biological Survey records.) For Montana there is no actual breeding record and according to the latest authority, A. A. Saunders (1921), there is only one reliable summer record, though older writers have stated that the species breeds in the State, which is reasonable. To my knowledge no one has yet recorded a nest from Wyoming, although in Utah it nests abundantly on the Bear River marshes and at Rush Lake (Cooke, 1906; Wetmore, 1921), as well as in the Barr Lake region of Colorado (Felger, 1909; L. J. Hersey and Rockwell, 1909), and commonly at Lake Burford, New Mexico (Wetmore, 1920). In the sand-hill region of western Nebraska there has been a great increase of nesting Red-heads (Oberholser, 1920) and in many parts of South Dakota it is a fairly common breeder (McChesney, 1879; Agersborg, 1885; Visher, 1913). The same is true of North Dakota, which may be regarded as one of the chief breeding areas (Job, 1899; Bent, 1901–02; Lincoln, (MS.); U. S. Biological Survey notes). In Minnesota the Red-head used formerly to nest not rarely in the northern part (Cooke, 1906) and it is said still to do so in very small numbers (Roberts, 1919). Whether or not it ever nests in Iowa is not certain (R. M. Anderson, 1907). According to Goss (1891) his brother discovered this species breeding at Horicon Lake, Wisconsin, and Kumlien and Hollister (1903) state that a few still nest at Lake Kushkonong in the same State. The easternmost breeding records are for St. Clair Flats, Michigan (Collins, 1880), where a few may still breed (Barrows, 1912). Boardman's statement that he found it nesting near Calais, Maine, is very questionable.

Western United States

Winter Range

On the Pacific Coast the Red-head may be found in winter as far north as the coast of southern British Columbia (Kermode, 1904) and in the interior as far as Okanagan (A. Brooks, 1920; Munro, 1923). It is a rather rare bird on the coast of Washington, though it has been taken on Puget Sound (W. L. Dawson and Bowles, 1909) and in Bellingham Bay (Edson, 1908), and on the Oregon coast at Scio and near Portland (Woodcock, 1902). In California, on the other hand, the species is common during winter (Grinnell, Bryant and Storer, 1918).

Inland it is known to winter occasionally as far north as Utah and Nevada (Hoffman, 1881; Cooke, 1906). In Arizona it has been found at Tucson and on the San Pedro River (Scott, *fide* Swarth, 1914), and it is said to winter in New Mexico also (Cooke, 1906). A few have been known to pass the cold season in Colorado (Felger, 1909), Kansas (Cooke, 1906), Missouri (Widmann, 1907), Illinois (Cooke, 1906), Michigan, — St. Clair Flats and Wayne County (Wood, 1910), — and even the Canadian side of Lake Ontario, Toronto and Burlington (McIlwraith, 1894; Fleming, 1906). Eaton (1910) says that occasionally it may be found on the New York side of Lake Ontario in winter.

On the Atlantic Coast Red-heads have, in very exceptional instances, been taken in winter as far north as Boston, Massachusetts, and on the Rhode Island coast (G. M. Allen, 1909; *et al.*). On Long Island Sound it is considerably more common (Eaton, 1910). It cannot, however, be termed an abundant bird in New Jersey (W. Stone, 1909) and hardly in Delaware (Rhoads and Pennock, 1905). But in Maryland it is common (Kirkwood, 1895), especially on Chesapeake Bay (Rives, 1890; *et al.*). North Carolina is the center of its distribution on this coast in winter, and there it is very abundant

(T. G. Pearson, C. S. and H. H. Brimley, 1919), becoming less so in South Carolina (Wayne, 1910), certainly uncommon and irregular about Charleston (letter from C. Chapman) and actually rare in Florida (Cory, 1896).

In the interior a few sometimes winter as far north as Lake Ontario, not far from Toronto; and occasionally in some of the New York lakes (Canandaigua and Seneca especially) they are present in large numbers up to the end of December or even later (Bird-lore, vol. 25, p. 16, 1923).

On the Gulf Coast the Red-head is found very commonly in Louisiana (Beyer, Allison and Kopman, 1907) and in the Mississippi Valley as far north as Arkansas, Big Lake, etc. (Howell, 1911; and others) and southern Illinois (Cooke, 1906). Strecker (1912) describes it as rare in central and eastern, but common in the west-central and southern parts of Texas. Indeed, from various reports, it seems to have a tremendous center of abundance all along the lagoon region of southeastern Texas away down to Cameron County (U.S. Biological Survey notes; J. C. Merrill, 1878; W. Lloyd, 1887; Cooke, 1888; Griscom, 1920; etc.).

Beyond our borders the Red-head winters to some extent in Mexico. In Lower California it has been taken at La Paz and in May at both San Rafael and Trinidad (Brewster, 1902). I suppose its breeding at the latter localities, so near the Californian boundary, is not beyond the range of possibility. In Mexico proper the species has been noted in winter in Chihuahua, at Boca Grande, Janas and Conalitos Rivers (Baird, Brewer, and Ridgway, 1884), at Mazatlan (G. N. Lawrence, 1874), in Zacatecas (British Museum), at Guanajuato and Guadalajara (Dugés, 1869) and in the Valle de Mexico (British Museum; Herrera, 1888; Villada, 1891–92).

Mexico

In the Bahamas (Riley, 1905) as well as in Jamaica (March, 1864; P. L. Sclater, 1910) and, according to Cory (1889) in Cuba, the Red-head has occasionally been seen in the cold season.

Migration

Throughout the central tier of States the Red-head is known chiefly as a bird of passage. This area includes Washington (W. L. Dawson and Bowles, 1909), Montana (A. A. Saunders, 1921), Wyoming (Grave and Walker, 1913), South Dakota (Visher, 1909, 1913), Nebraska (W. E. Taylor and van Vleet, 1888), Colorado (Felger, 1909), Kansas (Goss, 1891; Bunker, 1913), Missouri (Widmann, 1907), Iowa (R. M. Anderson, 1907), Minnesota (Hatch, 1892; Roberts, 1919), Wisconsin (Kumlien and Hollister, 1903), Illinois (Ridgway, 1895), Indiana (A. W. Butler, 1898), Michigan (Barrows, 1912), Ohio (L. Jones, 1903; W. L. Dawson, 1903), Pennsylvania (B. H. Warren, 1890), New York (Eaton, 1910), and New Jersey (W. Stone, 1909). In Canada the species occurs commonly on migration in Ontario (McIlwraith, 1894; Fleming, 1906) and fairly abundantly even as far as Ottawa and Montreal (Wintle, 1896). Rather unusual is Millais' (1913) statement that he has seen thousands on the St. Lawrence between Quebec and Rimouski and J. and J. M. Macoun's (1909) note that on the St. Lawrence and on the Gulf it is rather common, for it is a rare bird at Quebec (Dionne, 1906), and has occurred but rarely on Anticosti (Schmitt, 1904). For the southern coast of Labrador there is only one questionable record, namely, Baie des Broches, September 23, 1880 (C. W. Townsend and Allen, 1907). In the Maritime Provinces (Downs, 1888; J. and J. M. Macoun, 1909) as well as throughout New England (G. M. Allen, 1909; and many others) it is an uncommon migrant. In these latter regions and indeed in most of the area east of Lake Michigan the species is seen primarily or almost exclusively in autumn. It appears that the Red-head at this season takes a rather roundabout route going almost due east to reach its winter quarters on the Atlantic coast, while in spring a more direct line is chosen, up the Mississippi River Valley.

There is nothing characteristic about the dates of migration in this species. From Cooke's (1906) valuable contribution and from the works of writers cited above the following representative dates may be given: in spring they leave the Valle de Mexico in March, and Louisiana about the middle of February. They pass Moss Point, Mississippi, about March 1, traverse Missouri between the same date and April 10, Kansas in early March to April, Colorado in late February and early March,

central Nebraska about March 10, Iowa about the middle of March, Illinois in March, Indiana and Ohio about the middle of March, Michigan during the latter half of March; they reach Wisconsin, Minnesota and South Dakota late in March, Montana in the first half of April, southern Ontario late in March, and Manitoba in April. In the northernmost parts of the range they do not appear before May. The few specimens that pass over New England are usually seen during March.

The autumn migration is rather more extended than the spring movement. In southern Ontario Red-heads begin to appear during the second half of September, while at Long Point, Ontario, the species is most common between October 15 and 30. They arrive in Pennsylvania and New England in October, and Virginia late in October. In the Mississippi region they leave Manitoba in October, linger in Michigan and South Dakota from late October till November or December, pass Kansas City late in October and November and arrive in Mississippi and Louisiana about the middle of November. Great migrations have been seen in Mercer County, North Dakota, as early as October 3. Farther west the species passes through Montana during the second half of September, and through Colorado in late September and October, arriving in the Valle de Mexico in October.

Although there is not enough information to found any theories on it is common to remark an excess of male birds on migration and also at times in the winter quarters. Disproportion of sexes or what seems such is rather common among various species of diving ducks.

There is one important set of records showing the dispersal of banded Red-heads from Bear River, Utah. Wetmore (MS.) marked 239 of these ducks and got fifty-one returns. Besides a large number from north and central Utah there were returns from southeast Idaho (3), southeast Colorado (1), western Texas (1), and south-central Kansas (1). The west to east dispersal is interesting and instructive.

GENERAL HABITS

Our poor Red-head has fared very ill at the hands of ornithologists. At one time English writers and even Audubon and Wilson regarded it as identical with the Common Pochard of the Old World. Then came a period in which it was generally admitted to full specific rank, but recently Millais (1913), Hartert (1920a) and other Englishmen have again relegated it to the position of a subspecific variety. It all depends on one's conception of what constitutes a species or a subspecies, but as a matter of fact, this duck does not resemble the Pochard much more than our Canvas-back does. The bill of the latter is peculiar, but the bill is not a very important part of the anatomy in estimating relationships of ducks.

In its general habits our Red-head closely resembles the Pochard in so far as feeding, courtship and nesting behavior go. It is a fresh-water duck, although it is very partial to brackish water and may at times be found on water that is almost completely salt, as, for instance, in Pamlico Sound, North Carolina. It is so particular about its habitat and food, that it is extremely irregular in its appearance, so much so, in fact, that in regions where it is usually seen in thousands it may almost disappear for a term of years. In consequence wild stories of its increase or decrease are circulated from time to time, and it becomes, of course, very difficult to make a fair guess at its actual status in any one place.

The appearance of the adult male is unmistakable although it is often confused with the Canvas-back, but the profile of the bill and forehead, as well as the color of

the scapular region, are very different in the two. Females and young are very easily confused with females of Canvas-back, Ring-necked Duck and even Scaup. From the first it may be told by its shorter bill and higher forehead; from the second by its larger size, lighter back, and differently marked bill. From the Scaups it differs in having a gray instead of a white speculum, and also in having less white on the fore part of the face. Griscom (1922–23) has remarked that in a mixed flight of Red-heads and Scaup the former are apt to mount higher in the air so that the top stratum is more likely to be composed of that species.

Wariness. In comparison with Mallard or Black Duck, Red-heads are rather foolish birds. Not only are they more easily approached on the water, but when once they have made up their minds they come easily to decoys and sometimes respond readily to an imitation of the female's call. But being birds of broad waters it is not always easy to make a large bag, because they have a curious way of taking certain routes on their flights and sticking so closely to a particular water-lane that a battery anchored just outside their line of flight will have no shooting at all. This probably has nothing to do with instinctive wildness, however. Their inquisitiveness is or rather used to be taken advantage of by using a tolling dog to draw them toward the shore where the shooter lay concealed. When Mr. Francis Harper (MS.) was on the breeding grounds at Athabasca Lake, a pair of Red-heads, impelled by curiosity, swam up to within twenty yards of him while he lay partially concealed near the water. In our New England ponds they do not respond to the seductions of live decoys but will almost always follow a flock of wooden Scaup decoys rigged on an endless line and pulled toward the shore after the flock has swum up to them.

Daily Movements. Red-heads are active on the wing both morning and evening and through the middle of the day are comparatively quiet. Where they are much disturbed they retire to deep waters as soon as the morning shooting has begun, or if in brackish sounds they rise high in the air and start their daily flight to the sea. In fine weather they sit outside the breakers all day long and do not come in until after sunset or perhaps even after dark. If, however, the sea becomes choppy during the day, they are forced to come into the sounds for shelter, and at such times, if the weather is boisterous enough, large numbers are taken.

During migration they prefer to travel by night like all the diving ducks, but sometimes daylight seems to catch them before their destination has been reached.

If left entirely to themselves they would feed most actively in the early morning and late afternoon hours, but in a great many places they have been forced to adopt other habits. They can feed at night like the Common Pochard, especially if the weather is fine and the night bright. I doubt if they can do this so successfully on dark or stormy nights. In some localities both Red-heads and Canvas-backs shot in

the early morning have empty crops, but in other places I have been assured by reliable observers that they dive actively at night. D. G. Elliot (1898) agrees with this; he says, "Red-heads feed much at night, especially if the moon is shining, and at such times are exceedingly busy, and the splashing of diving birds, the coming and going of others, and the incessant uttering of their hoarse note, are heard from dark to daylight." Certain it is that Red-heads are more easily driven from their feeding grounds by too much shooting than are the more nocturnal surface-feeders.

Gait, Swimming, Diving. Our Red-head has the same general shape, posture and gait as its European cousin.

They get most of their food at moderate depths, at from three to ten feet. Grinnell, Bryant and Storer (1918) say that individuals are occasionally seen dabbling about in the mud in the shallower ponds.

Flight. The flight of the Red-head is so similar to that of many other diving ducks that it is difficult to differentiate. When the great flocks pass overhead on their daily trips to the ocean it is not at all easy to distinguish this species from Canvas-backs, although the native shooter recognizes them almost as soon as he can see them, just how it is hard to say. Of course they appear shorter, chunkier and not so light in color. Then again, their flight is not so steady as the Canvas-back's, and there is more shifting and mixing among different members of a flock. The "Canvas" has the steadier and more goose-like method of traveling, but the shape of the flock is about the same. It is doubtful whether any one can tell Greater Scaup from Red-heads at long distances. The flock formation, wing motions and the shape of the individual birds are just the same. The observer has to wait until he can see the colors as a rule.

D. G. Elliot (1898) paints a vivid picture of high-flying Red-heads: "They appear like a dark ribbon against the sky, and the comparison is strengthened by the fact that every movement of the leader elevating or depressing his course is imitated exactly by all those which follow, and so the line has frequent wavy motions, like currents passing through it, as when a ribbon is held in the fingers and a flip given to it which causes it to undulate along its whole length."

Flocks of migrating Red-heads usually arrange themselves in long irregular lines or in blunt wedges and on a still day a gentle swishing sound may be heard from passing bunches even at a great height. Elliot thus describes the movements of a flight arriving at its southern home: "The flocks rarely alight at first, even when there may be numbers of duck congregated on the water, but traverse the length of the sound or lake as if reconnoitring the entire expanse, and trying to select the best feeding ground. After having passed and repassed over the route a few times, the flocks begin to lower and gradually descending, at length the wings are set and the

birds sail gradually up to the chosen spot, usually where other ducks are feeding, and drop in their midst with many splashings. But while this is the usual method adopted by newcomers, sometimes the program is changed and the birds, attracted by a large concourse of their relatives, particularly if the day be calm and the sun shining with considerable heat, will suddenly drop from out the sky in a rapid zigzag course, as if one wing of each duck had been broken, and they cross and recross each other in the rapid descent, their fall accompanied by a loud whirring sound, as the air is forced between the primaries. On such occasions the flock is all mixed up together in a most bewildering manner, until, arriving a few feet above the water the wings become motionless and the birds glide up to and alight by the side of their desired companions."

Enormous numbers may suddenly arrive from the north within the space of an hour or two, and sportsmen who have been lucky enough to be on the spot describe it as one of the most impressive sights to be seen in the bird world.

Dr. H. B. Bigelow tells me that once at Long Point, Lake Erie, he saw a great flight of Red-heads depart from the marsh. They began to rise up in flocks of from fifty to several hundred during mid-afternoon and after circling around and rising to a great height bore off directly south. This movement was kept up all the rest of the afternoon and by the next morning few Red-heads were left in the marsh. Mr. Frank Benson saw the Red-heads arrive at the same place one morning, coming down from a great height. The flight lasted a couple of hours and at the end of that time the marsh, which before was empty, swarmed with them.

Association with other Species. The little straggling flocks of Red-heads which come, as by accident, to our Massachusetts ponds, are almost always associated with Lesser Scaups; sometimes one or two Red-heads in a flock of Scaup, and sometimes the reverse.

On the wintering grounds, as a rule, Red-heads and Canvas-backs occupy rather different areas of the same sound and do not intermingle. Red-heads feed in shallower water and are often accompanied by Scaup, the Lesser Scaup if the water is fresh, the Greater Scaup if the water is salt. In some places Red-heads are found mixed with huge rafts of American Coots. I do not believe that American Widgeon feed among Red-heads or Canvas-backs so much as some of the older writers seemed to believe.

Red-heads show a certain irresponsibility in the manner in which they deposit their eggs in the nests of other species. Thus, on the breeding grounds, they are not only very sociable amongst themselves but they intermingle with Canvas-backs and Ruddies.

Voice. The only typical note which I have ever heard the male utter is a sound

like *mee-ow*, so exactly like that of a cat that the first time I heard it from captive birds I could not believe that it came from a duck. It is similar to the note of the male Pochard but distinctly more catlike. In spite of the fact that this had been correctly described some time ago (Langille, 1884) many writers, even to the present time, have shown complete ignorance of it; one recent observer (Munro, 1919) considered it a feeding note. In reality this cat-call is heard only in the spring. Wetmore (1920) who describes it as a "curious drawn-out groaning call, resembling the syllable *whee-ough* given in a high tone," heard it at Lake Burford, New Mexico, from males during display. I have remarked that this catlike note is usually just audible at thirty or forty yards, but sometimes it carries farther than this. The throat-swelling which ordinarily accompanies it can sometimes be seen even when no sound is audible, so that at times the utterance must be very faint. Mr. F. Harper (MS.) says he could hear nothing of it at 100 to 125 yards.

From a captive male, who was executing some curious jerky movements with his bill, I several times heard a short coughing sound, barely audible at twenty-five yards. Was this part of a display?

The female uses at any season, a coarse churring sound, usually written *kurr-kurr-kurr*, very much like that of the female Pochard or Scaup. This call has been described by some as a distinct *quack*, but to me it seems very different from the note of a Mallard or a Black Duck, and hardly to be compared to it. Wetmore (1920) describes a modification of this note which he heard during display and which he writes *quek que-e-ek*, the last a peculiar rattling note.

The trachea resembles that of the male Pochard. The labyrinth is flattened and smaller than it is in the Canvas-back.

Food. The Red-head, like the Canvas-back, is extremely fond of wild celery and will take it wherever it can find it, but is not at all dependent upon it. The analysis of 358 stomachs (U.S. Biological Survey MS.) which I have been able to study shows nothing particularly noteworthy about the diet of this duck. Eighty-three of them came from Okanagan Landing, British Columbia, where the birds were living at the time almost entirely on musk-grass which forces the proportion of this food far too high in the general average.

Vegetable food was a little over 90% of the whole and the pond-weed family made up 38.88% of it. The favorite food was sago pond-weed (*Potamogeton pectinatus*), present in 62 gizzards. The seeds of all the pond-weeds were taken in very large numbers (as many as 1242 in one gizzard) as well as the tubers. Widgeon-grass is clearly another very valuable food for attracting Red-heads and the enormous number of 5120 seeds of this plant were taken from one bird.

Algæ, of which musk-grass was the favorite, comprised 15.92% of the whole, for reasons given above, while sedges were found in 86 gizzards and were 9.84% of all

the vegetable food. The seeds are the only parts of sedges that are commonly eaten and the numbers taken from individual stomachs run well over one thousand in several cases.

Grasses, mostly wild rice, made up only 7.50%. Wild celery was taken from 17 stomachs and comprised but 2.36% of all the vegetable food, the winter buds and the tender leaves being the parts which the ducks preferred. Other families of plants went to make up the general diet: water-lily seeds, water milfoils, duck-weeds, coontails, smart-weeds and miscellaneous vegetable matter, none of it of economic importance.

Red-heads in this series took animal food to the extent of only 9.14% and among this the mollusks were, of course, the most important: at least 2400 shells of a small fresh-water snail were present in one stomach and, in all, 26 different species of shells were identified. Insect food was not important (2.53%) because most of the ducks studied were taken in winter, but the few that were shot in the early autumn contained a relatively higher percentage of insects. There were only two stomachs that held any remains of fishes. Four birds had eaten crustaceans.

It seems that where they are feeding on salt or almost salt water they take some of the finer and shorter *Zostera* (eel-grass) which grows on sandy bottom. They certainly do not like the long coarse *Zostera* which we see commonly on the New England coast. I have noticed that in Pamlico Sound, North Carolina, where these ducks feed over the same bottom as Greater Scaup, the food of the Red-head is almost entirely vegetable and their flesh excellent, while the Scaups are packed full of shell-fish and are pretty inferior table birds.

Audubon, who is apt to lay stress on the more unusual food, mentions having found their stomachs crammed with young tadpoles, and small water "lizards" (newts) as well as blades of such grasses as grow around the banks. On several occasions he relates having found "pretty large acorns and beechnuts in their throats, as well as snails, entire or broken, and fragments of the shells of various small unios, together with much gravel."

Two stomachs taken from birds shot in the Athabasca delta in June contained 96% animal matter (U.S. Biological Survey).

Courtship and Nesting. On their northern migration Red-heads pair later than some of the common surface-feeders, particularly Mallard and Black Duck. Recent investigations in the Mississippi Valley, by the U.S. Biological Survey, seem to show that the diving ducks attain sexual maturity comparatively late.

The display postures of the Red-head (see Plate 57) are so similar to those of the Pochard that great detail will not be necessary here. The male throws back his head at frequent intervals so that the occiput touches the lower back but he does not use the kicking motion of the Golden-eye. I do not think that the throw-back is performed

quite so rapidly as in the Golden-eye, but the bill is thrown so far back that it actually seems to stick out beyond the tail! Often the throw-back movements are not seen and the males swim about with the neck held rather stiffly and erect, preparatory to uttering the extraordinary cat-call. A very marked swelling begins on the lower cheeks and throat, extending rapidly downward at the same instant that the *meow* call becomes audible. This call may immediately follow the throw-back of the head, but is heard more often without the full display. I have seen a captive male in spring going through other motions difficult to interpret. He began suddenly to dart his head forward in quick jerks, about one to the second, the bill snapping to and fro about an inch each way. Sometimes this movement was repeated even more rapidly, accompanied by a sharp cough, only audible up to about twenty-five yards. This performance was entirely separate from the regular display.

Under natural conditions a small group of males is often actively engaged in courting a single female. Wetmore (1920) describes the female as also displaying, approaching one of the males, her head held high, "sometimes jerking it up and down and again holding it erect, and at times calling *quek que-e-ek*, the last a peculiar rattling note." The male chosen extended his neck, holding head erect, frequently whirling about to show the female his back, or again sank down with his head drawn in while the female bowed. Sometimes the female opened her mouth or bit gently at the male or sprang quickly in front of him. There was a good deal of jealousy and transferring of attention from one mated pair to the other and the males made frequent rushes at one another. The calling of the males continued after the birds were permanently mated.

Mr. Allan Brooks tells me that he has noticed still another antic in the display of the Red-head. This consists of a quick lift forward and is not associated with the ordinary attitudes described above.

The nesting season, like that of the Pochard, is rather late; late, that is, compared with that of the Mallard and the Pintail, but much earlier than that of the White-winged Scoter. For most of the breeding area late May to early June is the normal laying period in an average season. Many nests are found in California in late May and early June and there is an exceptional record of a nest found in Alameda County on April 23 (Grinnell, Bryant and Storer, 1918). In other southerly localities, like New Mexico and Utah, the nesting season is in early June. The earliest nest noted in Colorado was found on May 31, and many more were taken in June, even late in the month (Rockwell, 1911). In North Dakota and Saskatchewan the season is very nearly the same as farther south.

The ordinary Red-head's nest is a large loose structure of dead flags built among standing rushes over shallow water or mud. At other times it is built on the ground in thick sedge or weeds and is constructed of the same material. It is usually well hidden from overhead observation but can sometimes be discovered by the down

which adheres to the rushes in the immediate neighborhood. Rockwell (1911) describes two unusual nests, very close together in burrows in the top of a large musk-rat house. The rat-house was at the edge of a small lake in a sparse growth of cat-tails. A careful survey of all the rat-houses failed to discover any Red-head nests similarly situated. Although most of the nests are well concealed Rockwell found one in an open growth of cat-tails over eighteen inches of water where there was no apparent attempt at concealment. Some of the nests are much larger and more loosely constructed than others, and, as with Pochard, there are cases where very little down is added. The down is light-colored, a delicate white, faintly tinged with gray (W. L. Dawson and Bowles, 1909).

Quite the most interesting phenomenon connected with the home life of this duck is the irregularity in the size of the clutch, and the frequency with which it lays its eggs in the nests of other ducks, particularly those of the Canvas-back and the Ruddy. But it is even more erratic than this, and helps to swell the clutches of Pin-tails, Mallards, Shovellers and Scaup. Indeed, one of my correspondents, Mr. A. Wolfe, of Edmonton, Alberta, writes me that in his opinion some Red-heads do not build any nest at all. He has collected many eggs for purposes of rearing ducks in confinement and usually he found the Canvas-back incubating in cases where Red-head and Canvas-back eggs were present in the same nest. In his region he tells me that about half the ducks' nests contain mixed clutches, usually those of Canvas-back, Red-head, Lesser Scaup and Ruddy. A remarkable nest, on which a Mallard was brooding, contained sixteen eggs: five of the Red-head in different stages of incu-bation, two fresh Canvas-back eggs, five highly incubated Mallard eggs, and four Shoveller eggs in different stages!

Many observers have had similar experiences. Bent (1907) found a few Red-head eggs in almost all Canvas-back nests in Saskatchewan. He also describes the curious "dumping" nests, in which many eggs are deposited and perhaps never incubated at all. In North Dakota, Job (1899) found Red-heads laying in the nests of Canvas-backs and Ruddies, while Shields (1885) found a nest near Los Angeles with fourteen Redhead, three Ruddy and five Coot's eggs, a Red-head female being on the nest. The latter writer (Shields, 1899) also describes Red-head nests containing one or more eggs of the Fulvous Tree Duck. In Colorado clutches composed of Red-head and Ruddy Duck eggs have also been found (Rockwell, 1911).

This duck lays a large clutch, but so irregular are the laying habits that the aver-age is very difficult to determine. Ordinarily a clutch numbers from ten to sixteen, averaging about twelve, but nests with fifteen, seventeen, eighteen and twenty-two eggs have been recorded. In the case of the last, Bent (1901–02) believes that it was the work of one female.

The color of the eggs varies from greenish drab to light buff, paler and more highly glazed than the Pochard's according to Mr. Wormald. They are elliptical in

shape, averaging 61 by 43.5 mm. with a maximum length of 65.5 and a minimum length of 58.5 mm. The breadth is from 44 to 42.5 mm. (27 eggs in U.S. National Museum — Grinnell, Bryant and Storer, 1918).

Although the eggs are not always easy to tell from those of other ducks the down is whiter than that of the Canvas-back. It really is nearly white although certain portions of it have a slight grayish tinge (Bent, 1923).

One observation on the length of the incubation period as given by Job (1915) is twenty-eight days, but I think this must be well above the average, for three sets which Mr. Wormald reared in 1924, hatched in from twenty-four to twenty-five days. Bent (1923) gives twenty-two to twenty-four days, and Mr. Wolfe (*in litt.*) hatched his in twenty-two to twenty-three days under bantams.

Mr. Job told me that in those he reared in Connecticut the most forward were able to fly out of the pen in sixty-seven days after hatching, at the same age as his Carolina Ducks flew.

Status. No doubt the Red-head was much more abundant in the past than it is now. This is particularly true of the sounds and bays of Maryland, Virginia and North Carolina, where both Red-heads and Canvas-backs have been ruthlessly shot ever since Colonial times. The decrease on the upper waters of the Chesapeake, however, is due not only to over-shooting, but also to the silting-up of the mouths of several of the rivers and the consequent failure of the food supply. The introduction of German carp is also a contributory cause, for these fish are vegetable feeders and destroy great masses of the choicest diving-duck food. No doubt this duck needs careful consideration from our law-makers because it breeds for the most part in a very well-settled region and because in the East, at least, it is shot by the very destructive method of the battery-boat or sink-box.

Starting with the autumn migration in the region of the Great Lakes, figures for the Monroe Marsh Club, near Monroe, Michigan, show that 5159 Red-heads were taken between 1885 and 1901, constituting 10.5% of the total number of ducks killed; not quite equalling the Canvas-backs in number. During the spring season in these same years comparatively few Red-heads were shot, not remotely approaching the toll of Blue-bills (Scaups). At the Long Point Club on Lake Erie, where enormous numbers of Red-heads arrive the second week in October and stay until early November, 13,905 were shot between the years 1887 and 1920 inclusive, making 9% of all ducks taken there. At this Club they greatly exceeded the Canvas-backs, which numbered only 5778. But Canvas-backs did not appear in any numbers at this point until 1901. I am told that in the old days, before accurate species records were kept, they used to shoot up to 4000 or more Red-heads in a single year, but the largest number recorded on their books is 2727 in 1903. It is a curious thing that in the earlier years of shooting, from 1887 to 1900 inclusive, moderate numbers of Red-

heads were shot, from two in 1891 to 792 in 1887, whereas during the same period only 48 Canvas-backs were taken. The sudden appearance of the Canvas-back after 1900 is due to some change of food supply which also led to an increase of Red-heads, for the largest returns for the latter species come in the years 1902–05. After this there was a distinct falling off, though good years occasionally occurred. The year 1919 with a record of 1430 was the best season since 1905, which suggests a recent recovery. There seems to be no other place where Red-heads form any larger proportion of the total bag than they do at Long Point. No doubt this is a great gathering point from which one group departs for the lower Mississippi Valley and the other for the coast of Virginia and North Carolina.

How far eastward the Red-head is common in the St. Lawrence basin I do not know, but from all the information I can gather I should call it a rare bird everywhere beyond Montreal and the northern parts of Lake Champlain. Mr. Millais' remark that he saw immense flocks on the river between Quebec and Rimouski strikes me as very unusual, and he has told me since that he was not absolutely certain of his identification.

There is no evidence that the Red-head was ever anything more than an uncommon bird in New England, except on two or three ponds along the south shore of Martha's Vineyard. My own records for Wenham Lake give a good idea of the actual status in northeastern Massachusetts during the years 1899 to 1920. During those years 103 Red-heads were shot representing 3.5% of all the ducks taken. Only 49 others were identified. These were shot in sixteen out of the twenty years in question, and the last ten years have shown a great decrease over the first ten; 1901–03 were the best Red-head years at Wenham, as they were at Long Point. Many other Massachusetts ponds take even a smaller toll of Red-heads than this.

Its status on Martha's Vineyard in Massachusetts has been discussed by Forbush (1912). In those ponds which have at times been completely salt there is excellent food for diving ducks, including wild celery, widgeon-grass and *Potamogetons*, and during some years several thousand Red-heads gather there in October, November and December, mixed with a much greater number of Lesser Scaups. There are some on Nantucket Island too, but the species has fallen off in the past ten or fifteen years in Massachusetts. In the Rhode Island and Connecticut coastal ponds there has been no special diminution, in fact, in the latter State, Sage, Bishop and Bliss (1913) think there has been an increase since 1902, but the species is irregular there and cannot be considered abundant on an average.

Red-heads appear in increasing numbers in flocks of Scaups, both Greater and Lesser, along the coasts of Long Island and New Jersey to Delaware and Maryland, where at the head of Chesapeake Bay they become really plentiful. The great decrease of this duck and of the Canvas-back on the upper waters of the Chesapeake dates from about the time of the Johnstown Flood and cannot be entirely blamed on

the market-shooters and sportsmen of the mid-nineteenth century. The floods on these rivers are no doubt due to deforestation. From the Back Bay of Virginia, which is particularly well favored by Red-heads, through Currituck Sound to the salt waters of Pamlico, the species is still about as numerous as the Canvas-back; in the salt water much more so. It is impossible to say how great has been the decrease in the past twenty or thirty years, for the market-shooters did not keep records and the clubs get very few diving ducks. It may be ventured, however, that the Red-head began to fall off rapidly in Carolina waters after 1880, and that in recent years (1912–24) it has not shown the increase that the Canvas-back has, either there or in other places.

In the old rice-growing regions of South Carolina, and in Georgia and Florida, Red-heads are and always have been extremely scarce, their places being taken by the Lesser Scaup. It is rather interesting to note that Audubon recorded it as more abundant on the Santee River than twenty years previous to the writing of his book. Now it only represents a minute fraction of one per cent of the ducks taken at the Santee Club. At the Canaveral Club, on the east coast of Florida, only thirty-one were shot in the thirteen years, 1908–09 to 1921–22. Along the whole Gulf Coast the species is more common, though not a leading duck in the Mississippi Delta. In the season of 1913–14 only 798 Red-heads were marketed in New Orleans out of a total of 283,435 ducks, considerably less than three-tenths of one per cent. It seems to get commoner as one goes west and really large numbers winter in southern and eastern Texas.

It is certainly scattered in its distribution in the Southwest, occurring here and there in large numbers but poorly represented on the whole. When we come to California we find the Red-head only tolerably common and far behind the Canvas-back, although it is the commoner breeding bird of the two. Some statistics given by Grinnell, Bryant and Storer (1918) show only 119 Red-heads reported by the American Game Transfer Company at San Francisco in the season of 1910–11, out of a total of over 71,000 ducks. In this list it is only 6% of the Canvas-backs represented. During the five seasons 1906–11 the Hunters Game Transfer Company of the same city received only 593 Red-heads out of a total of over 357,000 ducks. In this case Red-heads totalled 8.5% of the Canvas-backs. Another set of figures, compiled from the records of five Game Transfer Companies in the season 1910–11 showed only 286 Red-heads out of a total of 185,867 ducks. Here they were only 3.5% of the Canvas-backs.

Turning to the breeding regions of the interior, Dr. Wetmore (1920) found about thirty pairs nesting on Lake Burford, New Mexico, near the southern extremity of the summer range, but on the Bear River marshes, Utah, a spot particularly well adapted for its needs, the same writer (1921) found it by far the commonest nesting duck and represented by at least 1725 pairs. In Nebraska, where the Red-head was

almost wiped out as a breeding bird, Oberholser (1920) records it as greatly increasing in recent years. In the center of its abundance in summer, in North Dakota and southwestern Saskatchewan, it about equals the Canvas-back and the Ruddy Duck in numbers, but when one reaches the Athabasca delta, it becomes a rare breeder. Mr. Francis Harper (MS.) saw only twelve there in June, 1920. Even in eastern Oregon (Lake Malheur) as many as five hundred pairs have been reported as nesting (U.S. Biological Survey records)!

Major Allan Brooks (*in litt.*) seems to think that the species has been increasing in British Columbia during the past twenty-five years, until now it is the commonest duck at Okanagan Lake. In Wisconsin, Hollister considered it greatly reduced by 1903 (Kumlien and Hollister, 1903), and at Delavan Lake it represented only 2.51% of all the ducks he shot there from 1892 to 1899, the Canvas-back being slightly more numerous (Hollister, 1920). The returns from licensed hunters in Minnesota in 1920–21 indicate that the Red-head slightly outnumbers the Canvas-back, averaging about 60,000 out of a total of well over a million ducks, or around 6%. These last figures are very crude estimates.

To sum up, we see that this duck took a very decided drop in numbers during the last half of the twentieth century; in the East the decrease began even earlier. There is evidence of a satisfactory gain in numbers since 1913, when the Federal Law went into effect. The closing of the large markets of the East between 1911 and 1918 was one of the most important gains, for Red-head and Canvas-back were the mainstay of the professional gunner.

Enemies. No doubt the most serious enemy of the ducks in the prairie region to-day is the Common Crow, which has greatly increased under the new conditions brought about by agriculture. I have received very alarming reports on this subject from Mr. Wolfe of Edmonton. In the season of 1922 he calculated that 125 ducks' eggs were destroyed by Crows at one lake, to his own certain knowledge. Farther south Magpies are probably more serious egg-stealers, and in some places such as Bear River, Utah, they constitute the worst bird pest. No doubt bounties will have to be offered to reduce the numbers of these "winged vermin." Red-head nests may not be so exposed to the attacks of coyotes, foxes and other mammals, as are those of the ducks which nest on dry land or at the edge of water. The location of many of the nests over water or treacherous mud ought to prove some protection against coyotes, but I know of no investigations on this point. The ducklings, and the old birds too, are exposed to the same enemies that have been enumerated under the Mallard. I have seen the Bald Eagle chase and finally kill apparently healthy Red-heads.

Red-head, and more often the Greater Scaup, are taken by accident in some numbers in gill-nets set for shad on the west shore of Pamlico Sound, North Carolina, so

I am informed. These shad nets are set in rather shallow water. I have read that ducks were taken in the Chesapeake by this method years ago.

Damage. The Red-head, like other diving ducks, very rarely interferes with growing crops. I have never heard of any complaints about it in the rice-fields of California or Arkansas, where, as a matter of fact, migrants arrive too late to injure the grain.

Food Value. One of the favorite topics of discussion among epicures of the past generation, a race unhappily extinct in these prosaic times, was the comparative merit of the Red-head and the Canvas-back as a subject for the culinary art. If in those halcyon days there existed men with tastes so discriminating that they could distinguish between the two, that breed has long since departed to the Happy Hunting Grounds, where, let us hope, they are undisturbed by prohibition and kindred ailments.

If market prices are any indication of the relative esteem in which the two species were held, then the odds were certainly greatly in favor of the Canvas-back, for during the last years when game was legally marketed in eastern cities Red-heads were selling at from $3.50 to $4.00 the pair, and Canvas-backs at from $6.00 to $8.00 the pair. In the nineties Red-heads were not at all expensive, about $2.50 a pair. In Audubon's time they sold for as little as $1.00 a pair in New Orleans and seventy-five cents in Baltimore! No doubt the Canvas-back has a slight advantage in flavor and texture, but aside from that it is better because it is a bigger bird and because it rarely feeds in salt water.

Audubon regarded the Red-head as far inferior to the Canvas-back and many other ducks, but he is not very clear as to what he thinks of the Canvas-back. Probably the best Red-heads as well as Canvas-backs came from the Gunpowder and adjacent rivers on the upper Chesapeake. The Currituck Red-heads were never considered quite so good, and those from Pamlico, where the water grows salt, are distinctly inferior. I have eaten many New England Red-heads which were hardly better than Scaups.

Hunt. The pursuit of the Red-head is so nearly like that of the Canvas-back that the reader is referred to the account of the latter for a brief survey of the methods used in taking them both.

A successful method sometimes used in Massachusetts ponds for decoying Red-heads and Blue-bills is interesting and worth mentioning, as it does not seem to be employed elsewhere. On these ponds where permanent camps and large teams of live goose- and duck-decoys are maintained, groups of wooden Scaup decoys, nailed on sunken wooden triangles, are sometimes rigged to an endless line that runs out

from the "blind" to the top of a sunken buoy several hundred yards out from shore. Most of the flocks of Scaups, called here Blue-bills, alight in the middle of the pond. The runner is pulled back and forth so as to impart a swimming motion to the flock of wooden ones, and the diving ducks, whatever the species, are apt to notice this and swim toward it. Then the wooden flock is pulled rapidly toward shore, the wild ones following, until they are near enough to shoot at. This method works well with the few Red-heads which we get here. They behave in a more nervous manner than Scaups and are apt to follow a short distance, then fly up and come back again. If the wooden decoys are kept ahead of them so that they never entirely reach them, they "work" better. When the little flock approaches shore they get more and more nervous, their necks are stuck straight up and their heads twisted about in an enquiring manner. Shallow water, especially if the bottom is bright and sandy, they are fearful of and they will not often follow over such a course. Finally, when the flock thinks it is high time to depart for safer waters, they leave the wooden blocks and in their confusion are apt to pack very densely, affording a deadly opportunity, which if it came often enough (which it never does here), would provide many a good meal. The moving runner-line will not work, of course, in very weedy places as it gets covered with snarled vegetation.

Ducks that have been banded and some of them afterward shot, give us a good idea of the mortality brought about by man in one season. At Bear River, Utah, Wetmore banded 239 Red-heads a few years ago. Of these 51, or 21%, met their fate at the hands of some shooter, which seems a high average. It is, in fact, higher than for any other species which he was able to band except the Mallard.

Behavior in Captivity. There are few records of the Red-head ever having been kept in collections of live water-birds in Europe. It seems that it was shipped abroad in a live state only in recent years. With us it is often kept, lives fairly well for a moderate number of years, but seldom breeds. Probably no really good strain of hand-raised stock has ever been produced and carried on. Certainly, wild-caught adults or cripples very seldom nest, although they may live in an apparently healthy state for three to five years. I have kept a goodly number from time to time. They are much longer-lived than the Canvas-back under similar conditions, and doubtless would do just as well as European Pochards. Like other diving ducks the male does not usually go into a very perfect eclipse in confinement, and the onset of the summer moult is delayed.

I do not know who first bred the Red-head from captive specimens, but of the following I am sure, for I saw it myself. Sometime during the middle or late nineties the late Mr. Wilton Lockwood, who had a splendid lot of water-fowl at South Orleans, Massachusetts, was rearing this and other ducks in considerable numbers. On one visit I saw a fine lot of young Red-heads and remember that he fed them

partly on the meat of horseshoe crabs which were easily picked up at low tide near his house. Mr. Frederick Gallatin has also bred the Red-head according to what Mr. Lee S. Crandall tells me, and some were reared on Mr. William Rockefeller's estate in 1915. I have no reason to think that this species is any harder to rear than the Pochard once a good breeding strain is isolated. This duck seems to have been sent alive to Europe at one time, for Heinroth mentions it and describes its voice in the Berlin Zoölogical Gardens. Miss Hubbard (1907) says that the London Gardens secured them in 1902 for the first time. Thirty to forty pairs were sent to England between 1900 and 1904, selling at £4 and £6 the pair. They proved almost impossible to acclimatize and were a poor investment.

Some young hand-reared stock from wild-gathered eggs which I sent to Mr. Wormald in 1922 laid well in 1924. The first eggs were laid at his place in Norfolk, England, on April 18 and they averaged much earlier than Pochard eggs (April 28 to May 3). Two females that were mated to one male laid forty-six eggs between them. But perhaps the most interesting happening was the discovery that about half of these eggs were laid in the nests of other ducks: Pochards, Mallards and Yellow-bills. The two Red-head females made each a nest of its own but both commenced to deposit eggs in the same nest. Thus the same irregular habits found in the wild are perpetuated in confinement.

Hybrids. In the wild the Red-head is known to have crossed with the Common Scaup (*Nyroca marila*), the Ringed-necked Duck (*Nyroca collaris*), the Lesser Scaup (*Nyroca affinis*) and the Hooded Merganser (*Lophodytes cucullatus*) (Poll, 1911). Although it has doubtless been crossed with many other ducks in captivity, I know of only the two following: the Ringed-necked Duck and the Mandarin Duck. Specimens of both these crosses went through the hands of a dealer, Mr. G. D. Tilley, of Darien, Connecticut, in 1909.

Sanford (Sanford, Bishop and Van Dyke, 1903) mentions a cross between the Red-head and the Carolina Duck, without saying whether it was wild or captive-bred.

RING-NECKED DUCK

NYROCA COLLARIS (DONOVAN)

(Plates 58, 59)

SYNONYMY

Anas collaris Donovan, British Birds, vol. 6, pl. 147 and text, 1809.

Anas fuligula Wilson (*nec* Linné), Amer. Ornith., vol. 8, p. 66, pl. 67, fig. 5, 1814.

Anas (*Fuligula*) *rufitorques* Bonaparte, Journ. Acad. Nat. Sci. Philadelphia, ser. 1, vol. 3, p. 381, 1824.

Fuligula rufitorques Bonaparte, Ann. Lyceum Nat. Hist. New York, vol. 2, p. 393, 1826.

Fuligula collaris Bonaparte, Cat. Met. Uccelli Europ., p. 73, 1842.

Marila collaris Bonaparte, Comptes Rend. Acad. Sci. Paris, vol. 43, p. 651, 1856.

Fulix collaris Baird, Birds No. Amer., p. 792, 1858.

Fuligula affinis Sclater (*nec* Eyton), Proc. Zool. Soc. London, p. 365, 1859.

Nyroca collaris A. and E. Newton, Handbook Jamaica, p. 113, 1881.

Aythya collaris Ridgway, Proc. U.S. Nat. Mus., vol. 8, p. 356, 1885.

VERNACULAR NAMES

English: Ring-necked Duck, Ring-necked Scaup, Ring-necked Black-head, Ring-bill, Ring-billed Black-head, Ring-billed Shuffler, Marsh Blue-bill, Pond Blue-bill, Creek Red-head, Bastard Broad-bill, Moon-bill, Black-jack, Bunty, Golden-eyes, Mud Duck, Buck-eye, Black Duck, Tufted Duck, Blue-bullet, Puddle Duck, Butter-ball.

German: Ringel-moorente.

French: Morillon à collier, Canard noir.

Spanish: Pato negro, Pato morisco, Chaparro grande.

Mexican: Talalactli.

DESCRIPTION

ADULT MALE: Head and upper neck black with purple and green reflections, and on the chin a white spot. Occipital feathers rather long. Around the neck a more or less distinct chestnut collar merging into the deep black of the mantle. Scapulars, back, rump and upper tail-coverts black with greenish reflections. Tail very dark brown. Breast black, sharply distinguished from the pure white of the upper abdomen. On each side the white of the upper abdomen is continued up under the bend of the wing and sometimes by a few white feathers forms an irregular line between mantle and scapulars. Sides, flanks and lower abdomen finely vermiculated with wavy black lines. Under tail-coverts black. Outer wing-coverts dark brown. Secondaries gray, forming a pale gray speculum. Primaries dark brown, tertials greenish black. Under wing gray except the marginal coverts which are brownish, and the axillars which are white.

RING-NECKED DUCK

Male (Eclipse-September) Female Male

Iris bright orange-yellow. Bill, terminal part, about 10 mm. deep, jet black, including the nail. Posterior to this is a band a little less than 10 mm. wide (narrowest in the middle) which is ivory-white in color; remainder of bill, except a narrow white line all along the base of the culmen, dull slate color. Legs and feet yellowish slate, darker on the joints and black on the webs.

Wing 195–206 mm.; bill 45–49; tarsus 46.

Weight 1 pound, 8 ounces to 1 pound, 12½ ounces (0.68 to 0.80 kilograms).

ADULT FEMALE: Occiput dark brown to blackish, much paler on the forehead. Sides of head and neck gray, often mottled with blacker feathers. Region along base of culmen, chin and throat, much lighter than sides of head, sometimes nearly white. Upper side of neck and mantle brown, the feathers of the latter tipped with lighter brown. Scapulars like the mantle. Back, rump, upper tail-coverts and tail black. Upper breast pale brown shading into the pure white of the abdomen. Flanks sandy brown, lower abdomen shading into dusky. Under tail-coverts blackish and somewhat vermiculated. Wing as in the male.

Iris bright hazel or golden hazel; according to A. Brooks "yellow olive." Bill dark lead-color with sub-terminal bar of white; tip of bill black. Legs and feet greenish gray, with the webs blackish; about the same color as in the male.

The adult female is very similar to the female of the European Pochard and of the Red-head. From the former it may be distinguished by the absence of vermiculated pattern in the scapular region, and by its grayer head and smaller size. From the latter it can be easily separated by its darker color on the upper side as well as by its smaller size. Identification in the field is difficult, but the white-banded bill of the female Ring-neck proves a useful mark.

Wing 185–195 mm.; bill 43–46; tarsus 45.

Weight about 1 pound, 6 ounces to 1 pound, 9 ounces (0.62–0.70 kilograms).

Note: On the breeding grounds, in July, female specimens become very dark gray and mottled over the whole abdomen. Whether all specimens exhibit this dark summer phase I am unable to say, but it is interesting to note that the same phenomenon is seen in the Tufted Duck (*Nyroca fuligula*).

FEMALE IN FIRST (JUVENAL) PLUMAGE: Lower surface not white as in adult, but silvery gray, more or less mottled and barred with brown, especially on the breast and lower abdomen. Upper surface very similar to that of adult female.

Iris bright golden hazel to dark hazel. Bill black to blackish, with indistinct bluish band near the tip. Legs and feet same as in the young Red-head, light greenish gray.

MALE IN FIRST (JUVENAL) PLUMAGE: Very similar to the female at corresponding age, but by September a few black feathers will probably be found on the sides of the face and neck, and the occiput will be blacker. Remainder of plumage the same.

Iris usually more yellow than in the female.

IMMATURE MALE: The change to adult plumage is very slow. The white face-marks are gradually filled in with black feathers until the head becomes a dull black, with the neck gray. There is comparatively little change in the rest of the plumage all through the winter, and specimens almost like those seen in October may be found in April. The under parts remain gray and mottled. Full plumage is probably seldom reached until the second winter.

MALE IN ECLIPSE PLUMAGE: Not examined; but a definite summer plumage exists.

YOUNG IN DOWN: (see Plate 59) Most nearly like the young of the Canvas-back Duck (*Nyroca*

valisineria) but considerably darker on the occiput, back and rump. It differs also in having a broad white forehead sharply contrasted with the almost black occiput. As in the Canvas-back there are no dark face stripes. The light yellow patches on wings, scapular region and sides of the rump are very prominent in the young of this species. The downy young of the two Pochards are much lighter colored on the upper side than the young of the Ring-necked Duck and lack the prominent light patches on scapulars and rump.

DISTRIBUTION

The Ring-necked Duck is a species confined to North America, where it is one of the rarer ducks in most parts. We are still very much in ignorance as to its exact status and distribution, due largely to the fact that it is easily confused with both the Scaups and even with the Red-head.

Breeding Range

L. M. Turner, in his "Contributions to the Natural History of Alaska" (1886), says he found the Ring-necked Duck not common at St. Michael's, and that he met with it on Amchitka and in winter on Attu in the Aleutian chain. There can be little doubt now that there was some mistake in the identification of these birds, especially as Turner himself says they were so shy as to be unapproachable. At any rate the species has never since been recorded from Alaska. It is not impossible that Turner saw specimens of the European Tufted Duck, which the present species very closely resembles.

In northwestern Canada this duck is said to have been taken by Ross (*fide* Preble, 1908) as far north as Fort Simpson. This record may possibly be correct, but other observers have not found it much north of Lake Athabasca. Preble (1908) met with it at the mouth of the Peace River early in June, and Frank Russell (1898) recorded one specimen taken on May 22, at Fort Chipewyan, while in 1920 Mr. Francis Harper, collecting for me about Lake Athabasca, found limited numbers nesting at Egg Lake, fifteen miles northwest of Fort Chipewyan. He also saw specimens on the Athabasca delta.

We know practically nothing as to its breeding areas farther south in Canada. Allan Brooks (1903, 1917) has reported its nesting in the Cariboo and Chilliwack districts of British Columbia, but there is no actual record of its breeding in central or southern Alberta. Preble (1908) speaks of specimens seen on September 3 at Athabasca Landing, while Stansell (1909) saw only one in central Alberta. W. E. Saunders (1920) mentions ten Ring-necks seen at Wavy Lake, southeastern Alberta, on June 3, while Mr. William Rowan of the University of Alberta (*in litt.*) only found four autumn records for the central part. In southwestern Saskatchewan Bent (1907) found a nest which he believes belonged to this species, and there are breeding records for Osler and Indian Head (U.S. Biological Survey). R. MacFarlane (1908) says it was found at Pelican Narrows and Cumberland House. According to E. E. Thompson (1891) the species is fairly common in summer in Manitoba. He gives breeding records for Swamp Island, Waterhen River and Qu'Appelle, while Raine (1892) says he found it nesting on Long Lake. There seems to be evidence of a large breeding area north, and possibly east, of Lake Winnipeg (J. and J. M. Macoun, 1909). Even farther east at Lac Seul, Ontario, there is a record of downy young being taken July 12, 1919, by P. A. Taverner (U.S. Biological Survey notes).

British Columbia

Alberta

Saskatchewan

Manitoba

In the United States the Ring-neck has been found nesting at Eagle Lake, northern California (H. H. Sheldon, 1907), and it has been reported as doing so at Fort Klamath, Oregon (J. C. Merrill, 1888), as well as at Big Lake, and Marsh Lake, in the White Mountains of Arizona (U.S. Biological Survey). East of the Rockies it has been known to breed at Devil's Lake, North Dakota (Job, 1899; U.S. Biological Survey), in various parts of Minnesota (Hatch, 1892;

United States

MAP 82. Distribution of Ring-necked Duck (*Nyroca collaris*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

Roberts, 1919), in southern and eastern Wisconsin (Kumlien and Hollister, 1903; Goss, 1891), and at Clear Lake, northern Iowa (Cooke, 1906). In western Nebraska, too, it presumably nests, for it is found generally distributed there in summer (Bruner, Wolcott and Swenk, 1905; Oberholser, 1920).

On the Atlantic coast this species is said by Boardman (1871) to have bred at Calais, Maine, but I doubt the statements of this observer. He also asserts (1903) that it breeds not uncommonly in New Brunswick. There are casual records of occurrence in summer at Amesbury, Massachusetts; Concord, New Hampshire; Portland, Maine; and at Quebec. Schmitt (1904) reports a specimen shot on Anticosti Island on May 22, 1892, and Comeau (1909) took two specimens in spring at Godbout on the north shore of the St. Lawrence basin. It has even been reported in summer from Rock Springs, Texas, by a member of our U.S. Biological Survey.

Sporadic summer occurrences

Winter Range

In winter a few Ring-necks are found as far north as Okanagan, British Columbia (Brooks, *fide* Kermode, 1904), and Puget Sound (Rathbun, 1915). J. C. Merrill (1888) says it is common during the cold season at Fort Klamath, Oregon, and Woodcock (1902) has recorded it from Salem in the same State. In California it is rather rare, occurring chiefly in the west-central and southern parts, and up to 1918 there were only about 15 records (Grinnell, Bryant and Storer, 1918). There are only eight skins in the University of California collection. A few are said to winter at Pyramid Lake, Nevada (Ridgway, *fide* Hoffman, 1881), and it has been taken at Sacaton, Arizona, in February (Gilman, 1914). Possibly a few stay in New Mexico, too, for in southwestern Texas, and even at San Antonio, it is a common bird in winter (Dresser, 1866; W. Lloyd, 1887; Strecker, 1912; Griscom, 1920). Louisiana is probably one of the chief centers of abundance in winter; the Ring-neck is very plentiful there (McIlhenny, 1897; Beyer, Allison and Kopman, 1907; etc.). A considerable number probably stay in the Mississippi Valley, in Arkansas (Howell, 1911), southern Illinois (Ridgway, 1895), and even in Iowa (R. M. Anderson, 1907).

British Columbia

Western United States

Louisiana and Mississippi Valley

It is very abundant along the Gulf Coast as far as Florida. F. M. Chapman (1888) speaks of it as the commonest duck at Gainesville, and R. W. Williams (1904) says the same of Williams County. Griscom (1916) met with it at Tallahassee and Scott (1892) at Caloosahatchie. Dr. T. S. Palmer tells me that he has seen thousands on Lake Okeechobee. Farther north on the Atlantic side it becomes a rare bird or at least it was until three or four years ago (see under Status). A few are found in Georgia (U.S. Biological Survey), in South Carolina (Wayne, 1910) and in North Carolina (T. G. Pearson, C. S. and H. H. Brimley, 1919), perhaps even on the Potomac (Rives, 1890). Beyond this it is hardly more than accidental. There are a few winter records for Connecticut (Sage, Bishop and Bliss, 1913; Bishop, 1921) and I shot only three autumn specimens on Wenham Lake, Massachusetts, during twenty years' shooting. But in the last four years they have become commoner. Other New England records are very few and scattering, and the farther east one goes along the coast the rarer they become.

Gulf Coast

Atlantic Coast

Off the coast this species has been taken on New Providence in the Bahamas (Riley, 1905). H. Bryant (1859) describes it as common in the Bahamas. According to Gundlach (1875) it is one of the commonest winter ducks in Cuba, a statement which is certainly open to doubt, though Dr. Barbour tells me that he saw it regularly in the Havana Market, but in far smaller numbers than the Lesser Scaup. In Jamaica it is very rare at best (March, 1864; Bangs and Kennard, 1920). There are only two records of its occurrence on Porto Rico (Gundlach, 1878).

West Indies

In Mexico the Ring-neck has been taken at the south end of Lower California (Belding, 1883) and at Mazatlan (G. N. Lawrence, 1874), as well as in Chihuahua (Kennerly, *fide* Baird, Brewer and Ridgway, 1884). Specimens have also been recorded from the Rio de Coahuayana, Lake Patzcuaro, Jalapa, Lake Chapulco (Puebla) and Oaxaca (*fide* Salvin and Godman, 1897–1904). Villada (1891–92) has also reported it from the Valle de Mexico. The southern-

Mexico

Guatemala

most record of its occurrence is for the Coban River, Vera Paz, Guatemala, where considerable numbers were seen in November (Salvin and Sclater, 1860).

The Ring-neck has been known to occur only once on Bermuda, November 13, 1850 (J. M. Jones, 1859). It was originally described by Donovan (British Birds, vol. 6, pl. 147, 1809) from a specimen found in Leadenhall Market and said to have been shot in Lincolnshire, England.

Migration

The main migration route of this species undoubtedly lies in the Mississippi Valley. In the States of this basin it is a fairly common migrant, passing over in March and again in September. In the west-central States, however, it is so rare as a migrant that in many it can hardly be considered as more than accidental. The small numbers of birds which winter on the Pacific seaboard are perhaps those that breed in British Columbia. A few must reach the coast of southeastern Alaska for A. M. Bailey (MS.) saw about twenty-five in one flock at Kootznahoo Inlet in late October, 1920. The migration by way of the Great Lakes to the Atlantic coast is a small affair and it is later, for most of our New England records are in October and November. Two spring specimens were taken by Comeau on the north shore of the St. Lawrence besides a late September one (Comeau, 1909) and this seems to be as far east as they ever straggle on their flights. On the Carolina coast they hardly appear before late October, and in the spring are not uncommon on the Atlantic coast as late as April. There is no evidence, so far as I know, of any circular migration although they are commoner in autumn than in spring. Those that come to the Atlantic coast seem to return in spring over the same route by which they came, while those wintering on the Gulf Coast also appear to return by the Mississippi Valley.

Of the two specimens banded at Lake Scugog, Ontario, on October 29, 1920, one was shot at Back Bay, Virginia, on November 23, 1920, and the other near Georgetown, South Carolina, on January 5, 1921 (U.S. Biological Survey).

There are eleven returns of birds banded at Belle Isle Lake in southern Louisiana during February, 1922 (F. C. Lincoln, 1924), and these show the trend of Gulf Coast birds up the Mississippi Valley into Canada. They were taken at the following stations: eastern part of Galveston County, Texas; Gueydan, Louisiana; near Asbury, Missouri; Solomon River, Kansas; Franklin, Nebraska; Quincy, Illinois; Vilas County, Wisconsin; Meeker County and at Benson, Minnesota; Shellmouth in Manitoba; and two places in Saskatchewan: Isle à la Crosse Lake (near it) and The Barrier (40 miles west of The Pas, Manitoba). One of the Saskatchewan records is probably a breeding one but most of the others are for the autumn of the same year they were marked.

GENERAL HABITS

It is a curious fact that this duck was not described until 1809, and then by Donovan, an Englishman, who procured a specimen in the Leadenhall Market, London, supposed to have been taken in the Lincolnshire fens. It was recognized, described and figured by Alexander Wilson in 1814 but he confused it with the Tufted Duck of Europe, a species which he evidently had never seen. Prince Bonaparte (1824) pointed out Wilson's error and gave a very accurate description of both sexes, some account of its habits, and notes on its trachea. Audubon gives a full description and some interesting notes on habits.

This duck has usually been wrongly assigned to a position next the Scaups, but it probably has little affinity with them. It is far more closely related to the true Pochards and stands between them and the Tufted Duck as Hollister (1919a) has pointed out. This is apparent not only from the plumage, both adult, immatures

and downy young, but from the habits, voice and anatomy. The downy young looks very much like the young of Canvas-back or Red-head. Some of the older writers, Bonaparte, for instance, were more nearly correct than recent students, in associating this bird closely with the Tufted Duck (*Nyroca fuligula*) which it certainly resembles in some respects.

This is a difficult bird to distinguish in the field except when in the plumage of the adult male. Even then the ring, which appears so prominently in most portraits, is almost entirely covered up by the "drawn in" position of the neck. Old males, however, are easily told at long ranges by their dark heads and backs, crescent-shaped white marks in front of the bend of the wings, and banded bills. With the females and immatures the case is very different and the exact differences have been mentioned under Description. The Red-head is the only species from which it requires to be carefully separated and the field-marks are difficult. The banded bill, darker back (in all plumages) and smaller size of the present species are the only features that are easily noticed. But often these cannot be clearly made out. By sportsmen and market-shooters this duck has nearly always been confused with both kinds of Scaups and the Red-head, so that it is very difficult to get an idea of its status in different regions.

It is on the whole a strictly fresh-water duck keeping to retired pond-holes rather than to open water. It has a peculiar distribution, with a strong tendency to avoid both Atlantic and Pacific coasts, and a marked west to east autumn migration, besides one that takes it almost directly south.

Wariness. Most of the Ring-necks I have seen have been single stragglers and I noted nothing especial about their tameness or wildness. Not many writers have remarked any peculiarities in this respect. H. H. Sheldon (1907) spoke of them as not as shy as other ducks, but I doubt whether this bird differs much from Red-heads or Canvas-backs. The few flocks which I have been able to watch are certainly more nervous and alert in their behavior than the Scaups. They will not follow a moving flock of wooden decoys as the Scaups do, and are much more lively in their actions.

Daily Movements. There is little recorded. They probably feed as much as possible during the morning and evening and probably also at night.

Posture, Swimming, and Diving. The shape of the Ring-neck is Pochard-like, perhaps not so flattened as are the Scaups. They have exactly the appearance of other diving ducks on the water, but the elongate feathers of the head give the males a "full-headed" look, and the flank feathers or water-line in the males have a characteristic appearance.

I suspect that they prefer much shallower waters than the Scaups and feed more or less by dabbling as Audubon pointed out. Whether they prefer even shallower waters than Red-heads I cannot say. One writer (H. H. Sheldon, 1907) is so bold as to relate that he has seen them perching on the limbs of fallen dead pines rising above the water, an unusual position for a diving duck, to say the least.

Flight. I do not believe that these ducks can be distinguished by any peculiarity when on the wing at a distance. Audubon noticed a "constant whistling as they passed overhead" but I doubt if this is in any way characteristic. He is right in saying that "unlike the Scaups, they experience no difficulty in rising on the wing, whether from land or from the water." He adds that they generally spring up at once when alarmed, meaning, I suppose, that they have not the Scaup habit of swimming a good distance away before taking to wing. So active are these little ducks in the air that when coming head-on they have several times suggested Teal in their appearance, so much so that I took them for surface-feeders, not diving ducks.

The flocks do not appear to be ever really large, even where the birds are commonest as they are in Louisiana in winter. Two or three, up to a dozen, is the usual number noted. Allan Brooks gives them a great record for speed and considers them "the fastest flying ducks in America."

Association with other Species. It is doubtful whether the Ring-neck associates closely with other species. The stragglers which I have taken in Massachusetts waters were always alone. Allan Brooks (1899a) says that in British Columbia it frequents smaller ponds and more rushy localities than the Scaups but he has seen both species of Scaups, Ring-necks, Red-heads and Canvas-backs in one enormous flock.

Voice. The voice has been wrongly described as like the Scaup's. This is true of the females who often give vent to a rather loud *churr*-ing note like many other diving ducks. I could not make out anything distinctive about it. But the male's voice, which is in reality only a spring or courtship performance, I find described by myself as a "series of low lisping notes, not audible for more than fifty yards and sounding like *weet-wot-wut-wut-wut*, reminding me somewhat of the spring voice of the male Tufted Duck." It is clearly very different from the call of the Red-head or the Pochard, or the very low dove-like *coo* of the Scaup. Lord William Percy described this note to me, which seemed to him a "wheezing whistle," not a "clear whistle." Audubon long ago thought of it as "resembling the sound produced by a person blowing through a tube." It is possible that I did not hear the full courtship note from the pair which I had in confinement. The male is a silent bird at best and it was seldom that I caught him in a lively mood.

The trachea was first described and figured by Charles Bonaparte (1824) and is said to have a close resemblance to that of the Tufted Duck. It is about 190 mm. long and of nearly the same diameter throughout. The tracheal box is well developed with a strong bony keel and membranous windows. It is almost exactly the same in structure as that of the Greater Scaup with which I have directly compared it in fresh specimens.

Food. The food appears to be more vegetable than animal, at least in the winter. Gundlach (Cabanis, 1857) long ago found their crops full of the seeds of grasses and Audubon recorded roots and seeds of grasses, as well as snails and all kinds of aquatic insects, in addition to small fish and crayfish. In one case he took a frog with a body two inches long from a stomach, but the larger animal objects are doubtless very exceptional.

Courtship and Nesting. I have not seen the display in this species. William Percy watched about forty or fifty males courting four females on the Louisiana marshes near Grand Chenier on February 18. He noticed that these males held their tails very high, almost perpendicularly, and extended the crest. They also brought their heads back but without lifting the bill. He made particular note of the tail being held higher than in Scaups or Pochards. Audubon evidently was familiar with these courtship activities for he says that, especially toward spring they have a "constant practice of raising the head in a curved manner, partially erecting the occipital feathers, etc." The females he saw took no part in the display.

The laying season is early, certainly much earlier than with either of the Scaups or the Scoters. Whether this duck nests before the Red-head I cannot say, as the available dates are too few and far between. However, the latter part of May and early June is the usual time, but middle and late June nests are also recorded (Cooke, 1906; Baird, Brewer and Ridgway, 1884; Roberts, 1880; Job, 1899; Bent, 1901–02; A. Brooks, 1903; Grinnell, Bryant and Storer, 1918).

The nest seems to be rather a well-built affair but it is not at all like the bulky rush nests of the Pochards or the Ruddy Duck. One was placed in a tussock of grass standing in eight inches of water and with grass arched over it (A. Brooks, 1903). Another taken eight miles from Minneapolis, Minnesota, on May 27, was on an old sunken muskrat-house. It was compact and bulky, built mainly of fine grass, with a little moss intermingled. On the outside the grass was long and circularly disposed, while the bottom inside was composed of short, broken pieces, and the inside rim of fine grass bent and loosely tangled together with considerable down amongst it. Mr. Job found one breeding among rushes in the reedy, boggy arm of a lake in the Turtle Mountains of North Dakota.

The clutch seems to be large, perhaps averaging around nine or ten, but as many

as twelve have been found. The eggs are greenish or grayish white to buff, sometimes described as olive gray, measuring from 57.2–58.3 mm. in length by 40.6–41.8 in width. They are said to resemble very closely those of the Lesser Scaup; in fact, to be quite indistinguishable from the eggs of that bird.

The incubation period is unknown and there are no notes about the behavior of males during and after it. The female seems to be very artful in the manner in which she eludes pursuit, even while she is sitting. She is also very well able to look after her young and Francis Harper was much struck by her cleverness in the waters of the Athabasca delta. He thought these were the best of all duck-mothers, and describes very minutely the call which sent the young scurrying to cover and the same call, repeated in a lower, steadier voice, which was apparently used to gather them together again.

STATUS. There are several reasons why we know little about the actual numbers of this duck, whether on the breeding grounds, in its passage area or in its winter quarters. The female, her nest, and also the eggs are hard to identify, unless the bird itself is shot. On the autumn migration, especially outside areas where it is common, most of those which are shot are birds of the year, and consequently easily confused with Scaups and Red-heads. It is safe to say that only a small proportion fall into the hands of ornithologists. Then again the records of clubs and of markets are of scarcely any use for similar reasons. For some unknown reason it seems, since the year 1921, to have become a much commoner fowl on the Atlantic coast than it used to be. It remains to be seen whether this is merely a temporary fluctuation.

Starting with the Lake Erie region I do not know anything very definite. Mr. Ferris, the late caretaker of the Long Point Club, told me in 1915, that although no records had been kept he thought that usually only four or five were taken annually. The previous year, however, he remembered that about forty or fifty were brought in. It is more than likely that the species is much commoner there than these figures would indicate and that for a short time in mid-October and early November it may be really common in some years in the Lake region. There must be some at Port Perry, Ontario, and I have mentioned under Migration specimens banded there by Mr. Osler. In central and western New York (Eaton, 1901) and Ontario it is considered common at times and Mr. Julian B. Clark tells me he has shot a good many at Mississquoi Bay, north end of Lake Champlain. In western Pennsylvania it is regular but not common on migration (Todd, 1904). In the State of Maine, O. W. Knight (1908) mentions three or four records and Brewster (1924) only met with it five times at Lake Umbagog. Brewster (1906) could only give three for the Cambridge region, Massachusetts, and C. W. Townsend (1905) only one for Essex County, Massachusetts. Since then few new records have come to notice (G. M. Allen, 1913) until the year 1921 when it became almost common and I have taken 24 at

DOWNY YOUNG

(Upper) RED-HEAD (Middle) CANVAS-BACK (Lower) RING-NECKED DUCK

Wenham Lake in four years. In twenty years' shooting before that time I shot only three at the same place (Phillips, 1921). For Connecticut there are a dozen or so records (Sage, Bishop and Bliss, 1913; Bishop, 1921), and there are a few records for Long Island (Braislin, 1907). This gives an idea of its status in New England and so far as we know it was never any commoner.

I think there is no doubt about its being a much commoner duck on the brackish sounds of Virginia and North Carolina, at least during migration in late October and November, than we once thought. Most likely its appearance is not very regular but I have been told of a flight in the Back Bay region when one gun took twenty or thirty in a single day. Numbers have been seen also in western Virginia in early spring (E. A. Smyth, Jr., 1912). Dr. A. K. Fisher told me that he was astonished at the abundance of Ring-necks at the Narrow's Isle Club in North Carolina, in January, 1923, but that was, of course, since the recent increase along the Atlantic coast.

All down the Atlantic coast it is or rather was uncommon or irregular in appearance. More evidence of a very recent increase comes from Oakley, South Carolina, where Mr. Clarence Chapman has kept records at Mulberry Plantation since 1916. Out of 195 on his log-book only 27 were shot prior to 1921, the years 1921–22–23 showing comparative abundance. Mr. F. C. Lincoln found it very abundant in that region in late January, 1922. It probably does not winter regularly until Florida is reached and even in that State it is not at all common on the east coast (about ten in thirteen years' shooting at the Canaveral Club), but becomes much more abundant in the lake region of central and northern Florida and down even to Lake Okeechobee, where Dr. T. S. Palmer tells me he once saw it in thousands. It was reckoned as the commonest duck in Leon County, Florida (R. W. Williams, 1904) and very abundant at Gainesville (F. M. Chapman, 1888) and it is certainly abundant in the lakes near Tallahasse, as Mr. Ludlow Griscom has told me. He counted 1000 there on December 25, 1915 (Griscom, 1916).

When we reach the waters of the Gulf Coast we find it really abundant, figuring as five per cent among the ducks which used to be marketed in New Orleans, a proportion probably much too low, as many would appear on the records as other species of diving ducks. It is not found everywhere, of course, but the little coves and bayous connecting with the coastal lakes beyond the usual play of the tides, and where the water is nearly fresh, are, according to the Game Commissioner's report, the favorite places. Typical of these are the northern shore of Lake Catherine, Lake Pontchartrain, Lake Salvador and the inner marshes to the westward. Mr. McIlhenny considers it "very common" in Louisiana and this holds also for the Texas coast where Griscom (1920) found it "the commonest duck" near San Antonio, and others have given similar reports for the same region (W. Lloyd, 1887; Attwater, 1892). Indeed, it is an abundant duck in the whole Mississippi valley and in the Big Lake region of Arkansas is a famous autumn stronghold.

In California it has about the same status on the coast as it has with us on the North Atlantic shore but is commoner, although still rare in the interior valleys. Among the ducks shot at the Kennicott Duck Club in eastern Colorado only twenty-two were recorded for the past nineteen years (Bergtold, 1924). They are said to be occasionally very abundant in eastern Oregon (Klamath Lakes) in November.

Probably the greatest nesting center was formerly northern Wisconsin and Minnesota. In the latter State it is still a very abundant nester, one writer even considering it the commonest nesting duck (Roberts, 1919), but in Michigan it is only a rare spring and autumn migrant. Probably the breeding range will increase in the United States with better spring protection, and it seems likely that it will spread in the sandhill region of western Nebraska. It is probably very common as a breeder, also, about Lakes Winnipeg and Manitoba and less so northwest to Athabasca Lake. There, at the delta, Mr. Francis Harper found it only an uncommon breeder, the fifteenth in order of abundance of the ducks of that region. North of this it is probably not worth reckoning with.

Very interesting indeed is the small isolated colony of ten or twelve pairs discovered by members of our Biological Survey at Marsh Lake in the White Mountains of Arizona (U.S. Biological Survey field catalogue).

We do not know how much this duck has decreased in the West and whether there has been any recent improvement. In Wisconsin, northern Iowa, Nebraska and North Dakota it has gone down hill without a doubt, due to more intensive farming, the lowering of the water-table and the drainage of lakes and sloughs interfering with its nesting. This is one of the ducks that should be carefully watched, for it is not a far-northern breeder.

Food Value. It is one of the best of the diving ducks for the table. I find only one writer who fails to give it a good name and this one (Elliot, 1898) says it is about equal to the Little Black-head, which is hardly fair. In Louisiana, where it is much better known than anywhere else, it is greatly prized by hunters and is said to be always good. The older writers, Wilson, Ord and Audubon, approved of it and found it was never "fishy." I see no reason why it should not rank as nearly equal to the Red-head. I have carefully compared the flesh with New England-killed Red-heads, and although the texture is perhaps not quite so fine, the flavor is nearly the same and there is no lack of "juiciness." It is perhaps as near like the Ruddy Duck as anything.

Hunt. There is nothing especial to write concerning its capture. It is taken along with Lesser Scaup and Red-heads and appears to come readily enough to decoys.

Behavior in Captivity. Although seldom kept in collections in America and never in Europe, I believe from the few I have seen that this species is fairly well adapted to life in confinement, certainly much better than either of the Scaups and probably about as well as the Red-head. One which I have watched in Washington, an especially fine male, has been there four or five years and is in perfect health. I have a pair now which came to me a year ago. They have not shown any signs of nesting and were not active in courtship the first spring, but I hope that next spring they will at least carry out their full display. They are silent and undemonstrative thus far. Mr. Hollister, the late superintendent at the National Zoölogical Park, said that his single specimen was a very active, busy little duck but did not associate much with others except American Red-heads and European Tufted Ducks. It seemed to prefer the former.

Hybrids. Unless in adult plumage it is doubtful if crosses between this and other diving ducks would ever be recognized. There is one hybrid between the Ring-neck and the Red-head in the British Museum (Natural History) in London.

WHITE-EYED DUCK

NYROCA NYROCA (GÜLDENSTÄDT)

(Plates 60, 62)

SYNONYMY

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Anas africana Gmelin, Linné's Systema Naturæ, vol. 1, pt. 2, p. 522, 1789.
Anas ferruginea Gmelin, Linné's Systema Naturæ, vol. 1, pt. 2, p. 528, 1789.
Anas ægyptiaca Bonnaterre (*nec* Linné), Encyclop. Méthodique, vol. 1, p. 159, 1791.
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Anas leucopis Naumann, Naturges. d. Land- u. Wasservögel, vol. 3, p. 479, pl. 59, fig. 89, 1799.
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Aythya nyroca Boie, Oken's Isis, p. 564, 1822.
Fuligula nyroca Stephens, General Zool., vol. 12, pt. 2, p. 201, pl. 55, 1824.
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Nyroca obsoleta Brehm, Vogelfang, p. 380, 1855.
Æthyia nyroca Goebel, Journ. f. Ornith., vol. 18, p. 182, 1870.
Fulix nyroca Salvadori, Faun. d'Italia, Uccelli, p. 265, 1872.
Nyroca ferruginea Sharpe and Dresser, Birds of Europe, vol. 6, p. 581, pl. 438, 1872.
Marila nyroca Seebohm, History British Birds, vol. 3, p. 570, 1885.
Ilyonetta nyroca Heine and Reichenow, Nomencl. Mus. Heineanum, p. 347, 1890.
Nyroca rufa Mathews and Iredale, Austral Avian Record, vol. 4, p. 153, 1921.

Note: Mathews and Iredale (Austral Avian Record, vol. 4, p. 153, 1921) have proposed that the proper name for this species is *Nyroca rufa*, and credit the specific name to Linné (Fauna Suecica, ed. 2, p. 47, 1761). An examination of this citation shows that Linné was here using the word *rufa* not in a specific but in a descriptive sense (since it is not italicized), just as in the case of the duck preceding, both of which he says were birds unknown to him. The name is, therefore, a synonym dating from the later authors.

WHITE-EYED DUCK

Male

Female

BAER'S POCHARD

Male

MADAGASCAN WHITE-EYED DUCK

Female

Adult Male

Juvenal Male

Vernacular Names

English: White-eyed Duck, White-eyed Pochard, White-eyed Poker, Ferruginous Duck, Red Duck, Castaneous Duck, Wigeon (India).

German: Moorente, Weissäugige Ente, Weissauge, Braunkopf, Rotköpfige Ente, Moderente, Sumpfente, Brandtüchel, Mierente, Morgente, Knollente.

French: Fuligule nyroca, Canard rouge aux yeux blancs, Petit pilet tanné, Canard à iris blanc, Morillon à iris blanc, Sarcelle rousse, Bouice raujhé, Canard Hongrois.

Italian: Moretta tabaccata, Colletto, Terziolo rosso, Ruscinha, Rosella, Morettone, Cauete, Russulidda, Niedduzzeddu.

Spanish: Pardote, Coquinero, Negrete, Rochet, Anach chaculater.

Portuguese: Larro, Zorro, Perra.

Russian: Krasnogolowoi Tchern, Utka nyrok, Beloglasyi nyrok.

Icelandic: Hviteyg Önd.

Danish: Hvidöiet And.

Dutch: Witoog.

Polish: Kaczka ponur.

Esthonian: Baltatshu pihle.

Czech: Polák malý.

Croatian: Patka njorka, Patka bjelokrila.

Herzegowina: Zuta norva.

Hungarian: Czigány récze.

Montenegrin: Crnka.

Bulgarian: Plavka.

Dalmatian: Crnin.

Maltese: Braimla.

Arabic: Shetrusi, Boro.

Moorish: Ziriguil.

Canaries: Pato berberisco.

Kirgiz: Kizyl-ala-iyriok.

Tibetan: Chhu-cha.

India: Karchiya, Boorar-mada (Northwest Provinces); Lal-bigri, Bhooti-hans (Bengal); Burnu (Sind); Malac (Nepal); Chiki, Kanat Aurdak (Yarkand).

Japanese: Akajahiro, Mejirogamo.

DESCRIPTION

Adult Male: Head and neck rich chestnut except a small white spot on the chin; sides of mantle chestnut, middle and posterior part of mantle blackish. Scapulars, back, rump, upper tail-coverts and tail black with a suggestion of a greenish tinge; but the scapulars are very minutely dusted with dusky brown. Breast chestnut, like the head, but separated from it by a darker region, forming an indistinct collar. Sides and flanks brown mixed with chestnut; abdomen pure white except posteriorly, where, especially at the sides, it becomes dark brown or blackish. Under tail-coverts white. Wing-coverts dark brown except a white patch at the carpal joint. Speculum on the secondaries white, and framed posteriorly by a black band across the tips of these feathers. Primaries black on the outer web and tip, and white on the inner web. Tertials green-black. Under wing-coverts white except the marginal ones which are brown; axillars white.

Iris white, but not until completely adult at two years (Naumann, 1896–1905). Bill greenish black, grayer at the tip and along cutting edge. Legs and feet plumbeous black (Millais).

Wing 180–193 mm.; bill 39–41.5; tarsus 29–31.

Weight 1 pound, 2 ounces to 1 pound, 9 ounces (Hume) (0.51 to 0.70 kilograms), average about 1 pound, 6 ounces (0.62 kilograms).

Adult Female: Resembles the male but the head color is browner and the upper breast is not such a brilliant chestnut. The white of the abdomen is less clearly defined from the breast color and is tinged with brown. The feathers of the mantle and scapulars, like those of the flanks, have pale-brown edges.

Iris red-brown, becoming lighter with age, and sometimes reaching nearly to white (Millais). Bill blackish lead-color. Legs and feet bluish black, like the male's.

Wing 176–185 mm.; bill 36–40.

Weight 1 pound, 3 ounces to 1 pound, 6 ounces (Hume) (0.46 to 0.62 kilograms).

This sex is easily distinguished from the female of the Pochard by the presence of white wing-bars. The female Tufted Duck is easily confused with the present species and the diagnostic marks are rather fine ones. The Tufted is darker on the back and whole upper side, and the under tail-coverts are not so prominently white.

Young in First (Juvenal) Plumage: A plain brown duck. The head has very little tinge of chestnut and the mantle and scapulars are uniform dark brown like the top of the head. The upper breast is dark rusty brown, more or less barred with black, and the remainder of the lower parts is silvery brown, darker on the sides and flanks. The irides are brownish gray, which in the male changes to pearl gray by spring. The males and females are much alike at first. The former are larger and are said to have the flanks richer colored. The heads and necks are also darker while the iris is lighter. In this first plumage the White-eyed Duck may be confused on casual observation with the young of the Tufted Duck, but the bill of the present species is narrower and less "dished" on the culmen. The general body coloring may be very similar.

Male in Eclipse Plumage: The change, according to Millais, is somewhat like that which is seen in the Tufted Duck. His description is based upon captive specimens which, however, cannot always be compared to wild ones. The most noticeable change was in the head which became a dull, pale red-brown, while the lower neck, which is almost black in the full plumage, became edged with white or sandy brown. The eye lost much of its brightness, but did not change color. The greater part of the plumage seemed to him to be renewed only once. This, however, cannot be. Annie Jackson (in Witherby *et al.*, 1919–22) says that in this plumage the male is similar to the female, but the upper mantle becomes a lighter brown and the sides of the face, the neck, chin and throat are paler. There is a complete body moult in summer followed by wings and tail from end of May to August.

Young in Down (specimen in Museum of Comparative Zoölogy): Top of head down to a little above the eye, back of neck and whole upper side except wing- and scapular-patches almost black, with the longest feathers golden yellow. The whole side of head and supra-orbital region buffy yellow, lighter on the chin and throat. No face markings. Breast and upper abdomen sulphur yellow. Lower abdomen and flanks dark like the upper side.

Compared to the young of other nearly related diving ducks, this species is very different. It is easily distinguished from the black-faced downy young of the Tufted Duck and is very much lighter colored than the young of the Greater Scaup. It is perhaps nearer to the young of the Lesser Scaup. From this last it can easily be separated by the more brilliant yellow of the breast as well as by the light face color extending to well above the eye.

DISTRIBUTION

The White-eyed Pochard is essentially a bird of southeastern Europe and southwestern Asia, and is peculiar in that it is found wintering in almost all localities where it breeds. It is not, therefore, so decidedly a migratory species as other common European ducks.

MAP 83. Distribution of White-eyed Duck (*Nyroca nyroca*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

Breeding Range

The species is not known ever to have bred in Iceland, the British Isles, the Scandinavian peninsula or Finland, although about a century ago Faber twice saw specimens in Iceland in March (Hantzsch, 1905) and there are three or four records of occurrences in Scotland, about one hundred in England and about ten in Ireland, most records for the British Isles being spring occurrences on the east coast (Witherby *et al.*, 1919–22; Ussher and Warren, 1900; Millais, 1913; and numerous others). There is one record for Sweden (Kolthoff, 1903). In Finland, too, a pair is thought to have been seen on August 10, 1912, as far north as the Muonia-Enontekis district (Montell, 1917).

Iceland
British Isles
Northern Europe

In Holland and Belgium a few specimens are seen every year and a small number are recorded as nesting (Dresser, 1871–81; van Oort, 1908; Dubois, 1886), while in France this Pochard is known to have nested once near Dunkirk and perhaps in Lorraine (Paris, 1907). It is not improbable that a few breed in Provence, where, in Camargue, W. Eagle Clarke (1895) met with five on May 17. A certain number nest in the *marismas* of the lower Guadalquivir (H. Saunders, 1871; Arévalo y Baca, 1887) and, it seems, in certain localities in central Spain (A. Chapman and Buck, 1910).

Holland
Belgium
France
Spain

Its status as a breeding bird in Italy, where some have been reported nesting in Sicily, Tuscany and Lombardy (Arrigoni degli Oddi, 1904; Giglioli, 1886), has not yet been satisfactorily established. There is no evidence that any have ever nested in Switzerland, and in southern and western Germany (Bavaria, Würtemberg, Baden, Hessen, Rhine Provinces) as well as in Denmark (Collett, 1877) it is a very exceptional breeding bird. Though there are nesting records for Schleswig-Holstein (Bau, Blasius, Reichenow, and Schalow, 1877), Mecklenburg (Wüstnei, 1902) and Brunswick (R. Blasius, 1896), it is only in northern and eastern Germany, in Pomerania (Naumann, 1896–1905), East Prussia (Hartert, 1892), Posen and West Prussia (Naumann, 1896–1905) and Brandenburg (Schalow, 1915) that it breeds at all regularly, while Lusatia and Silesia are the only districts in which it is really a common nesting bird.

Italy
Germany

In Poland, on the other hand, it is a very common breeder (Taczanowski, 1888; Katin, 1912). Lesser numbers nest in Czecho-Slovakia (Fritsch, 1872) and Austria (Crown Prince Rudolf and Brehm, 1879), though in Hungary it is so abundant in the summer (von Mojsisovics, 1883, 1886; W. E. Clarke, 1884; von Schweppenburg, 1915) that this region can really be called the center of the breeding range in Europe. Numbers also breed in Herzegowina (Reiser, *fide* Millais, 1913) and in Montenegro (Reiser and von Führer, 1896) as well as in Albania and Epirus (Lilford, *fide* Dresser, 1871–81). In Bulgaria (Sintenis, 1877; Reiser, 1894) and in Rumania (Radakoff, 1879) it is everywhere a common breeder, but in Russia its range hardly extends north of 55° north latitude. Goebel (1871a) and Kessler (in Dresser, 1871–81) report it an abundant nester in Kief, and it is similarly recorded for Cherson (Brauner, 1894), and Ekaterinoslav (Valkh, 1911). It is found in Kasan in summer (Russki, 1893) and in southern Perm (Buturlin, *fide* Millais, 1913), but it is rare in the Urals, where Sabanäeff (Harvie-Brown, 1878) states that some nest near the Kaslin Lakes. Various writers state that the species was found by Blasius breeding on Lake Onega, and there are two specimens in the Museum at Archangel from the vicinity of that city. These are certainly unusual records. In the Baltic States the White-eye is a rare straggler (Loudon, 1909), a few perhaps nesting in Kurland (Goebel, 1873).

Poland
Austria
Succession States
Balkans
Russia
Baltic States

In northwest Africa this duck breeds chiefly in the west, where it is abundant in Morocco (Favier, *fide* Irby, 1875). Smaller numbers nest in Algeria, too, — Lake Zana and Djendeli (Salvin, 1859), Lake Halloula (Tristram, 1860) and Lake Fetzara (Zedlitz, 1914), — but its breeding in Tunis is still hypothetical (J. I. S. Whitaker, 1905).

Northwest Africa

The species has never been found nesting in Egypt, but it seems likely that a few do so in Palestine

(Tristram, 1884) and on Cyprus (Bucknill, 1911). It is a regular breeding bird throughout the northern parts of Persia (Zarudny, 1911), Afghanistan (C. Swinhoe, 1882), Transcaspia (Radde and Walter, 1889), Ferghana and Pamir (Severtzoff, 1883; Schalow, 1908). It is a very abundant breeding duck in Kashmir (Hume and Marshall, 1879; Davidson, 1898; Baker, 1921), and likewise, it appears, in southern Tibet (Loudon, 1905; H. J. Walton, 1906). Northward the breeding range includes Kashgaria (Scully, 1876), the southern and eastern Tian-Shan (Schalow, 1908), and all of Turkestan excepting the southwestern desert tracts (Severtzoff, 1883). Farther north still it becomes ever more rare as a summer resident. On the Kirgiz steppes it nests only occasionally (Suschkin, 1914) nor is it common about Astrakan and Sarepta (Moeschler, 1853; Seebohm, 1882). To the eastward, Smallbones (1906) found it rather common on the Ili River. It has been seen about the Sassyk-kul, Ala-kul and Marka-kul, and breeds regularly on the latter (Finsch, 1879; Poliakov, 1916). According to Hesse (1913) it is a rare breeder on the mountain lakes of the eastern Altai. Farther north the species has been taken at Tomsk on April 25 (P. and J. Zalesski, 1915) and is said to be not uncommon about Lake Chany (Finsch, 1879). Finsch also met with it near Obdorsk and found a specimen in autumn in the market at Tobolsk.

Palestine
Persia
Inner Asia
Western Siberia

Winter Range

In winter the White-eyed Pochard is occasionally found in Europe as far north as the British Isles, there being six winter records for Ireland (Ussher and Warren, 1900) and a few for England. On the Continent it has been seen during the cold weather in Germany near Danzig (R. Blasius, 1891), and along the Rhine (von Reichenau, 1888; Le Roi, 1906), as well as in Luxembourg (La Fontaine, 1865–72), in Poland (Taczanowski, 1888) and in Switzerland (Fatio, 1904). It is of regular occurrence, though rare in Provence (l'Hermitte, 1916), and not very common in Portugal (Tait, 1887; de Seabra, 1910). Small numbers have been seen in southern Spain (A. Chapman, 1888) but in the southeastern and eastern parts of the peninsula especially about Valencia, it is more common (Arévalo y Baca, 1887). Munn (1921) has recorded it from Majorca. It is not very common in Sardinia (Salvadori, 1865) or Malta (Despott, 1917), but is abundant in Sicily and a regular wintering bird in the southern part of the Apennine peninsula (Giglioli, 1886; Arrigoni degli Oddi, 1904). The species has on occasion been known to pass the winter in Hungary (Schenk, 1899), but is rare in Dalmatia (Kolombatovič, 1903). It seems to be more abundant in Montenegro (Reiser and von Führer, 1896), Albania and western Greece (Powys, 1860; Simpson, 1860), as well as in Macedonia (Harrison, 1918). Radakoff (1879) states that it is abundant on the Danube delta and about Burgas in winter, and Valkh (1911) says a few winter in the west of the Ekaterinoslav Government in southern Russia.

British Isles
Germany
Poland
Switzerland
France
Portugal
Spain
Italy
Hungary
Russia

In western Africa the White-eye has been known to occur as far south as northern Nigeria (two females taken at Zaria, — Hartert, 1915). It has also been taken on the Cape Verde Islands, Boavista, February 5, 1898 (Salvadori, 1899) and there is one good record of its appearance on Gran Canaria, in the Canaries, November, 1829 (Bannerman, 1919). It is regularly found in Morocco and is fairly common in northern Algeria (Rothschild and Hartert, 1912). Tristram (1860) states that he saw great numbers in the northern Sahara. In Tunis it is common (J. I. S. Whitaker, 1905).

In northeastern Africa this duck is extremely abundant in Lower Egypt in winter (Shelley, 1872; Nicoll, 1919), and is occasionally seen farther south. Both A. L. Butler (1908) and W. L. Sclater and Mackworth-Praed (1920) have recorded specimens from Khartum, and Ogilvie-Grant (1900) has reported it from Lake Harrar Meyer in southern Abyssinia. Others have been taken at Tigre, Aden and Sokotra (Matschie, 1893; Reichenow, 1900).

Western Africa
Northeastern Africa

Tristram (1884) describes this species as common in Palestine, but Sladen (1919) did not find it very abundant in the south. A few winter in Cyprus (Bucknill, 1911) and on the coast of Asia Minor (Braun, 1908). Although there are not many records, it is probably a common bird on the Euphrates in Mesopotamia. It is found in the Caucasus at Tiflis and abundantly at Lenkoran in the cold season (Radde, 1884) and likewise throughout most of Persia and Baluchistan (Zarudny, 1911; Meinertzhagen, 1920). In northern India it is extremely abundant, wintering in Kashmir and in the Himalayas and on the peninsula south rarely to about 17° north latitude or even farther on the east side. It is a common bird east to the Brahmaputra, though it is also found in the basin of that river in Chittagong, Sylhet, Cachar, Manipur and Assam (Hume and Marshall, 1879; Baker, 1921). It has also been recorded from Arakan (Baker, 1921) and from the South Shan States (Rippon, 1901).

Palestine
Asia Minor
Caucasus
Persia
India
Burma

As to the status of this species in China it is difficult to speak with certainty. According to David and Oustalet (1877) it is a common bird about Peking in spring, and many winter in China. Reichenow (1907) has recorded a specimen from Tsingtau, and recently La Touche (1921) has described it as "extremely abundant" during late September and early October in northeastern Chili! The same author thinks that two or three White-eyed Ducks which he saw in the Shasi Market (Hupeh) on February 25, 1918, belonged to this species. It has never been obtained in Japan. The records of Blakiston and Pryer (1878), Ogawa (1908) and others all apply to Baer's Pochard (Kuroda, *in litt.*). We need more material from eastern China to settle the point as to whether this duck is anything more than a straggler in eastern China and Baer's Pochard the common form, or rather the commoner form. Various reports of its occurrence in Jamaica are undoubtedly due to misunderstanding.

China

Migration

The White-eyed Pochard is, in many suitable localities, a resident bird, and seems, on the whole, to be averse to unnecessary traveling. It will winter anywhere if the weather permits. In consequence it is impossible to say much of value in regard to migration. The data are very meager and offer nothing worthy of note. We know that in northern Africa this duck, like many others, stays until May or sometimes even spends the summer. Migrant birds in Europe generally pass over Italy in February and March (Giglioli, 1886), over Dalmatia early in March (Kolombatovič, 1903), over Hungary about March 12, — average date of arrival 1895–1911 (Aquila, vol. 20, p. 144, 1913), — over Bohemia early in March (Fritsch, 1872) and arrive in Germany in late March (Naumann, 1896–1905), in Poland in early April (Taczanowski, 1888) and in southern Russia at about the same time (Goebel, 1871).

In the autumn they leave the north late in October or early in November, and reach northern Africa in November and December. One which was banded in England was taken in Finland during the following year in the breeding season.

Our data for Asia are even more fragmentary. They leave Lenkoran for the north late in February (Radde, 1884). Farther east they appear in southern Afghanistan early in February (C. Swinhoe, 1882) and pass over the Murghab River, Transcaspia, between March 23 and April 13 (Radde and Walter, 1889).

In the autumn they arrive at Lenkoran late in November (Radde, 1884). They pass over Kashgaria late in September and October (Oustalet, 1894) and linger in southern Tibet until late November (H. J. Walton, 1906), though the bulk reach India during the last week in October (Hume and Marshall, 1879).

GENERAL HABITS

This active little diver is not well known to the sportsmen of western Europe but it is the commonest breeding duck in some parts of southeastern Europe and even

in Kashmir. Systematically it stands quite apart from the true Pochards and differs from them in its habits, courtship and the appearance of its downy young. It forms a rather closely knit group with its oriental relative, Baer's Pochard or White-eye, the Madagascan White-eye and the Australian White-eye. This group again is slightly different from the Common Tufted Duck and still further removed from the South African Pochard and the Common Scaups.

It is a fresh-water duck with "skulking and secretive" habits, rather local and more or less sedentary over a good part of its range. In some places, such as the Ægean Sea, and also in India, it resorts to salt water regularly but probably this is not entirely from choice. Nevertheless it may be classed as a strictly fresh-water duck.

During migration it is found at high altitudes, 7500 feet in eastern Persia (Blanford, 1876) and 12,000 to even 15,200 feet in southern Tibet (H. J. Walton, 1906). In Kashmir, it is a common resident at 5000 feet, and in Turkestan it is said to breed between 3000 and 4000 feet although rather rare above 1000 feet (Lansdell, 1885).

Its natural preferences are for weedy lakes and pools of moderate depth, surrounded by thick vegetation. A great part of the time it keeps out of sight, seldom coming out in any numbers into open water. The best general accounts of the life-history of the bird are given by Hume and Marshall (1879), Naumann (1896–1905) and Baker (1921).

The White-eye has for field-marks the white eye, reddish head and white wing-bar in the male, but the females and young are easily mistaken for the females of the Tufted Duck (see under Description).

Wariness. There is no doubt about the rather stupid nature of the White-eye. All sportsmen agree to this and have a good deal to say about how closely it lies in the reed beds when a boat is pushed through its haunts. In India it is easy to get rising shots in this way at not over twenty yards distance so that large bags are often made. This is about the last duck to leave a piece of water after a bombardment begins, trusting rather to its habits of concealment than to removing to a safe distance as any sensible duck ought to do. Then, too, the flocks are small and scattered about, so that only a few get up at a time.

Daily Movements. There seems to be rather a marked difference between the White-eye and the Pochards in respect to their feeding times. The present species is mostly a day-feeder and is active throughout the noon hours. Moreover it does not have as marked morning and evening flights as do other diving ducks, for it is satisfied to stay in its chosen spot for long periods (Jerdon, 1864; Hume and Marshall, 1879). Of course where it has to spend the day on "bare-shored" lakes or rivers or in the sea (Harrison, 1918) it changes its ground toward evening. Hume

adds that he seldom found them asleep like other ducks between eleven and three and, more suggestive still, he seldom killed them when flight shooting.

Naumann (1896–1905) thought that in Germany they passed to larger and more open waters at night. Dalgliesh (1908), speaking of Bengal, thought that during the day they kept to the shelter of rushes, "feeding some and sleeping a great deal." On the other hand in Egypt, where small enclosed waters are not to be had, Shelley (1872) found them far out in the center of the great lakes of the Fayûm in the daytime. The nature of the country makes such a difference in the habits of all waterfowl that it is sometimes very difficult to hit upon any specifically characteristic habits.

Gait, Swimming and Diving. This is an extreme type of diving duck, which means that they are seldom found more than a few feet from water and are best adapted to that element. When startled they run down to the water's edge with a clumsy, shuffling gait. They are, of course, splendid swimmers and as far as diving is concerned, they are easily more expert than the Pochards. In Hume's language, "they swim with great rapidity and dive like the —— I was going to use an inappropriate simile, but they dive marvellously." They can remain under a long time, from 40 to 50 seconds, Hume thinks, and Naumann says they can stay as long as any other species or longer. However, they do not like to feed in very deep water, three or four feet being about right, while they get some food by merely tipping up.

Wounded birds are considered almost impossible to secure. "The instant that, wounded, they touch the water, they disappear, and not infrequently that is the last you see of them; at most they only rise once or twice, and then disappear for good. It is a waste of time to pursue them; if they do rise give them instantly a second barrel." Even the best dogs, says this Indian sportsman, are often baffled by this little duck and more often than not are apt to return from the chase after several minutes with their tails between their legs and a general crest-fallen appearance.

Flight. Not so strong on the wing as the Tufted Duck or the Pochard, these birds rise with some difficulty, especially if there is no wind, striking the water with their feet in an effort to get under way. They do not fly particularly fast, nor do they care about rising high in the air. Although there is nothing especially characteristic in their manner of flying to contrast with other common diving ducks, they are less apt to go a long distance. "Rising out of the reeds they fluster up and go off much like Partridges with a low, straight flight, often dropping suddenly, almost Quail-like, after a short flight."

Really large flocks are seldom, if ever, seen together. Even where they are in great numbers they always tend to break up into parties of three or four, or small flocks.

These little companies rise successively when put up in sheltered situations affording a chance to make enormous bags.

Shelley thus describes the departure of a great aggregation from a lake in Lower Egypt (Birket-el-Kurun) on a still day: "When disturbed [they] rose with a running flight, striking the water rapidly with their feet, and making a noise in so doing which could be distinctly heard at a couple of miles distance."

In the air the wings are said to make a slight rustling sound while the flocks tend to very little regular formation. The white speculum-patch is more conspicuous in flight than it is in the Tufted Duck, but from all accounts they must be difficult for the novice to tell from the latter species.

Association with other Species. They are not sociable, and seem distinctly inclined to keep aloof from other sorts of wild-fowl; even single specimens, Naumann says, stay by themselves. On the breeding grounds several nests are apt to be found rather close together. There are various notes in the literature which show that they are often found together with other ducks, but many of these mixings are, of course, only accidental. Then they have been noticed with Pochards in Palestine (Tristram, 1884), with Tufted Ducks and Golden-eyes in Macedonia (Harrison, 1918), with Pochard and Tufted Ducks near Constantinople (Weigold, 1913), and even with Great Crested Grebes on the Danube (Reiser, 1894).

Voice. The voice of the male, which is reserved almost exclusively for the breeding season, is a "low wheezing groan which can only be heard at close range" (Millais, 1913). This writer says that the sound is like that emitted by the Common Pochard and that he has heard it *occasionally* in autumn and winter. Mr. Gerald Legge (Millais, 1913) describes this note in the same way and likens it to that of the Common Pochard saving that it is less loud. I have never heard it myself. Naumann, and with him, Millais believe that the male has another note, a coarse *korr-korr-korr* something like that of the female, but I cannot bring myself to believe this, for none of the other male diving ducks have calls anything like those of their mates. To be more certain on this point I asked Mr. Hugh Wormald if he had ever heard his male White-eyes utter any loud call and his answer was emphatic: that the only note was a low, rather grating wheeze, "the sort of note which is impossible to put into words and difficult to locate when uttered by a bird mixed up with a lot of other ducks."

The female gives a loud *kra-kra-kra* or *kirr-karr* variously described and closely resembling that of the Pochard, although not so loud.

The trachea, first described and figured by Eyton (1838, p. 63), is that of a typical diving duck. It is six inches long, somewhat enlarged in the middle portion and smaller at both ends. There is a left-sided box at the lower end, partly membranous and partly osseous, looking very much like the type seen in all the Pochards.

Food. Judging by the almost universally harsh opinion as to the quality of the flesh it seems certain that they take an unusual amount of animal food, especially in India. In Europe, where the flesh is not in such very low repute it seems to feed a good deal on the roots, shoots, leaves, and seeds of water plants. Remnants of *Polygonum*, *Potamogeton*, *Nymphæa*, *Carex* and *Lemna* have been found in stomachs, and they are said to be especially partial to the hard *Potamogeton* seeds which they swallow together with a good deal of sand and gravel. The animal food was found to include "rain-worms," small shells, large and small *Libellulæ* and their larvæ, *Phryganeidæ* and other insects (Naumann, 1896–1905).

In India Hume and Marshall (1879) considered them quite omnivorous, though chiefly vegetable feeders. Besides ordinary water plants and their seeds he noted in their stomachs delicate fresh-water shells and shrimps, insects (including several species of *Neuroptera* and *Lepidoptera!*) and their larvæ, worms, grubs and small fishes. They noted that besides diving for food these ducks pick up part of their living while swimming, "nibbling at the herbage or picking shells or insects off the lotus leaves." They often re-appeared after a dive with a whole bunch of feathery weeds, which all present joined in gobbling up.

Baker (1921) does not entirely agree with Hume and Marshall, placing the animal food in India at 75% of the whole. Specimens he shot in the Diyang hill-streams had, in addition to caddis grubs, dragon-fly larvæ and similar material, quite a number of small fish, some of them three inches in length and most of them belonging to the "Miller's Thumb" species, a sluggish fish easily secured by these agile birds.

Courtship and Nesting. In Europe these ducks arrive on their breeding grounds in small companies toward the end of March, and immediately scatter about their nesting quarters. Naumann's account of their behavior in spring, as observed by him in Germany, is well worth summarizing. He speaks of the female being followed by several males who very soon come to blows. No duck, he says, is so quarrelsome as this one during the nesting period. They squabble so fiercely that they entirely forget their surroundings, until warned of approaching danger by the watchful females. The female is often obliged to seek refuge from the crowd of suitors in the thickest clumps of reeds, but once she makes her choice she slips away with her chosen mate into some retired spot, distant from the rest of the scolding company. Finally only the superfluous males remain, who not infrequently disturb the mated pairs, but at length leave the vicinity for good. I do not know whether others have noticed a like quarrelsomeness in the White-eye. All ducks are restless and full of mimic battles in the spring, but these seldom reach the status of a real quarrel, for they are too transitory. This bird is not quarrelsome in confinement.

Certain characteristics of the courtship were first pointed out by Finn (1902). It

consists, he says, in a sudden jerking back of the head on the part of the male, but the complete throw-back of the head on to the back, which is typical of the Pochards, is never performed. Gerald Legge (in a letter to Millais, 1913) thus describes it: "The throw-back of the head is very quick but I am sure that, although the head goes far back, the bill is never more than perpendicular. The drakes swim slowly around the duck, keeping up a very low chatter, very like, but very much gentler than, the ordinary chatter of the Mallard drake. Every now and then a male straightens out his head and neck along the water, then sometimes raises it suddenly to its full extent, and makes that curious wheezing cry, which is very like that of the Common Pochard. . . . The male does not always straighten up after flattening himself on the water, but when he does he always makes the 'wheeze.' He also raises his head and neck slightly two or three times in quick succession, at the same time swelling out his neck and wheezing. The throw-back of the head takes place frequently, and is by far the most noticeable part of the display." Millais adds that when the male lays out his head and neck along the water the pupil contracts so that the white of the irides is very brilliant. During courtship the male often sits high on the water and moves about with the tail much elevated, so much so that the white patch of the under tail-coverts becomes very conspicuous. It would be interesting if we knew the exact mechanism by which diving ducks regulate their buoyancy. That they can sit much higher when resting or during courtship, than when alarmed or feeding, is well known.

The nesting season is moderately late, the month of June being the normal breeding period throughout most of the range. This is true of central and eastern Europe, Morocco, Algeria, and central Asia. In Germany a few breed in late May (Naumann, 1896–1905; Hartert, 1892; Bau, Blasius, Reichenow, and Schalow, 1877) and the earliest in Poland was May 20 (Katin, 1912). According to Irby (in Dresser, 1871–81) nests were found on the *marismas* of the lower Guadalquivir, southern Spain, as early as the end of April. In the Danube Valley nests were taken after the middle of May (Seebohm, 1885) and in Kashmir some of these birds are said to nest as early as the end of April (Baker, 1921).

The nest itself is usually built close to the edge of the water or even over the same; sometimes it is almost, if not actually, floating. The materials used are the dry stalks of grasses, leaves of sedges and rushes, dry sticks, meadow grasses and occasionally a little moss. Several observers (Naumann, 1896–1905; Hume and Marshall, 1879; Baker, 1921) have noticed that the inside is carefully lined with much finer material, a habit which may be characteristic of the species. The nest is usually well hidden by plants whose ends cross over it. Some are so constructed that they can be approached only from the water side. An occasional nest has been found two or three feet above the ground in a bush (Taczanowski, in Dresser, 1871–81).

The ordinary clutch varies from six to twelve, averaging about eight or nine.

Hume and Marshall's (1879) collectors never found more than ten, but both Bau *et al.* (1877) and Baker (1921) have reported clutches numbering fourteen eggs, and Madarász one of twenty eggs (*fide* Millais, 1913), probably the work of two females. Clutches of twelve are not infrequent. The eggs when fresh, have a faint greenish tinge, which fades with age. The ground color is a pale brown to café-au-lait tint, which distinguishes them from those of the Tufted Duck. According to Seebohm (1896) they can be confused with the eggs of the Gadwall, Widgeon, Harlequin and Smew, but the shell of the White-eye's eggs is heavier than in those of the three last and the down is distinctive. The average measurements of 100 eggs are: 52.3 by 38.2 mm., the maximum length and breadth being 62.8 and 43 and the minimum 48.4 and 33.7 mm., respectively (Hartert, 1920a; Witherby *et al.*, 1919–22). The nest-down is very characteristic, being dark brown in color with a hardly perceptible white center and occasionally lighter tips (A. C. Jackson, 1918).

Other ducks frequently use the White-eye's nest as a place in which to deposit stray eggs; the White-eye seems always to do the incubating in such cases. The stray eggs are probably Pochard's (Mojsisovics, *fide* von Dalla-Torre and von Tschusi zu Schmidhoffen, 1888).

Mr. Portielje of the Amsterdam Gardens writes me that specimens which he reared were incubated for twenty-eight days but they have been hatched in less time than this by Mr. Wormald. Mr. Blaauw, writing to Millais (1913), also placed the incubation at twenty-eight days. Favier (in Irby, 1875) considered it thirty days, but this is certainly too long except possibly in cases where the eggs are very stale.

During incubation the male leaves the female, as is the case in all typical northern ducks. The female, like the ducks of other species, will lay a second, though smaller clutch if the first one is destroyed. The young are said to fly at the age of about two months. In September the young and old of both sexes join again and begin to migrate (Naumann, 1896–1905). This is a rather general statement, and I know of no good observations as to the distribution of ages and sexes during migration.

Status. Over a great part of its range the White-eye is one of the most plentiful species, especially on its breeding grounds. In Hungary it is the commonest breeding species of diving duck (W. E. Clarke, 1884, p. 147; von Mojsisovics, 1883) and the same is true of the Danube delta (Reiser, 1894). In southern Spain, Irby (in Dresser, 1871–81) found it more abundant than the Marbled Teal or the Garganey in the summer time. During the cold season Harrison (1918) found it by far the commonest duck in Macedonia, but at Lake Fetzara, Algeria, it was not so common as the Marbled Duck or the Common Pochard during the nesting period (Zedlitz, 1914). Shelley (1872) speaks of seeing immense flocks numbering thousands in Lower Egypt. Radde and Walter (1889) saw "hundreds" migrating in Transcaspia. In southern Tibet and in Kashmir it is certainly the commonest breeding

duck (Hume and Marshall, 1879; H. J. Walton, 1906; Baker, 1921). So abundant are they on the lakes of Kashmir that at one time boat-loads of their eggs would be brought into Srinagar.

Enemies. Captain Baldwin, and later Hume and Marshall (1879) and Baker (1921) have called attention to the frequency with which this and other ducks in India are shot with a part or the whole of one or both feet missing. The missing portions are cut clean and then healed. It seems unlikely that these wounds are caused by traps or by crocodiles. Probably some species of fish is to blame. The part of the bird's range where these accidents occur is not clear.

This species is prey to the usual enemies of ducks, which have been enumerated in the accounts of the Mallard, Pochard and others.

Food Value. It is hard to estimate fairly the value of this duck's flesh as an article of food, for it varies greatly in different parts of the range. In the opinion of some it ranks along with the Pochard, while others consider it downright inedible. Most European sportsmen speak of it as moderately good, and in southern Spain Colonel Irby considered it superior to either the Pochard or the Red-crested Pochard. This is the highest recommendation it has ever received. As long ago as 1653, Leonhard Baldner, the fowler of Strassburg, commended it for its meat. Indian sportsmen are particularly at variance on this point although on the whole it is considered poor (Hume and Marshall, 1879; Baker, 1921). Jesse (1903), however, found it "one of the best of Lucknow ducks" and Finn (1909) regarded it as "palatable enough." Taken altogether it must be relegated to a place distinctly lower than the Pochards.

Hunt. Eastern sportsmen speak particularly of the ease with which large bags of this duck can be obtained by simply pushing about in reed-covered swamps, and flushing one small bunch after the other without alarming the whole place. Their habit of keeping in small groups and lying very close seems to be quite characteristic. Then again it is easy to drive them up to a line of guns in a succession of small parties, "lasting sometimes for hours at a time." They have extraordinary vitality and require a heavy blow to knock them down. Wounded birds are even more difficult to get than Pochards.

MacPherson (1897) speaks of a method of taking White-eyes, and probably other kinds, employed by the natives of Kashmir. This consists of using floating fish-hooks baited with a certain kind of water-beetle, upon which the ducks impale themselves just as fish do.

Behavior in Captivity. Perhaps if this were a larger and showier species it

would be kept more often on ornamental waters, for it does very well under restraint and may be called a moderately free breeder. It is, however, much easier crossed with Tufted Ducks and Pochards than bred in pure strain. In England Lord Grey, Mr. H. Wormald, Mr. St. Quintin and probably some others have been successful in rearing them, while in Holland Mr. Blaauw considers them "very free breeders." But let not the unwary amateur expect to have the success of such experts else he will almost certainly be disappointed. If he has the good fortune to secure stock that is healthy and not too much inbred he may have immediate good luck but as a rule most of the diving ducks if wild-caught are exceedingly slow to nest.

Mr. Wormald's earliest date for nesting in Norfolk, as he gave it to me, is April 19, which is about in line with the Common and Red-crested Pochards, and the Rosy-billed Duck.

White-eyes are seldom sent over to America and even the zoölogical gardens do not often have them. A few years ago some were imported into New York under the name of "Golden-eyes" and a few were bought by the National Zoölogical Park in Washington. They have also been exhibited in New York from time to time and the price paid has been $10.00 each, this being a pre-war figure. I have never had them on my pond, and I doubt whether they have ever been reared in confinement in America, except at the New York Zoölogical Park (Crandall, *in litt.*).

The price in England before the War was from £2 to £3 per pair, but they were not very often offered, even at this figure. In France, Rogeron (1903) mentions 75 francs as having been paid by the Jardin d'Acclimatation.

In captivity some live to a considerable age. In the Calcutta Gardens they have lived at times "upwards of 7 years" (Sányál, 1892) and in the gardens at Frankfort a.-M. some lived as long as four to six years (Schmidt, 1878). The longest record is that of J. H. Gurney, who knew of one that was fifteen years old (H. Saunders, 1899).

The following notes, given by Mr. Blaauw (in Millais, 1913), refer to specimens he kept in his gardens at Gooilust: "The duck makes her nest either in a box which is placed on a pole in the water, and which is shaped like a small dog-kennel, or in the sedge along the water's edge. The eggs are from 7 to 11 in number, and are dark-buff, or pale coffee-brown in color. Incubation lasts from 27 to 28 days as a rule. As soon as the young birds are full grown and able to fly the irides of the young males begin to turn lighter in color, so that even before the autumn it is quite easy to distinguish the sexes with certainty." He adds that the young are easily reared on ants' "eggs," bread crumbs and duckweed.

Hybrids. In the wild state the White-eye only crosses commonly with the Common Pochard, though cases of a cross between it and the Common Scaup and

the Tufted Duck have been recorded. In captivity it has been crossed with the Carolina Duck, and with the Red-crested Pochard (Suchetet, 1896; Poll, 1911). In regard to this last-named cross Mr. Blaauw (in Hubbard, 1907) says: "This species readily produces hybrids with the Red-headed Pochards, and if a hybrid of this union is again mated with a White-eyed Duck, the offspring is scarcely to be distinguished from pure *Nyroca leucophthalma* (White-eye)."

MADAGASCAN WHITE-EYED DUCK

NYROCA INNOTATA SALVADORI

(Plate 60)

SYNONYMY

Aythia nyroca A. Milne-Edwards (*nec* Güldenstädt), Comptes Rend. Acad. Sci. Paris, vol. 91, p. 1036, 1880.

Nyroca innotata Salvadori, Bull. British Ornith. Club, no. 20, p. ii, 1894.

Marila innotata Bangs, Bull. Mus. Comp. Zoöl., vol. 61, p. 500, 1918.

VERNACULAR NAMES

English: Madagascan White-eyed Duck, Madagascan Pochard.

Madagascan: Ony, Onotra, Honjo.

DESCRIPTION

ADULT MALE: Nearest to the Common White-eyed Duck but differs in having the whole head and breast much darker chestnut. There is no white spot on the chin and no distinct collar around the neck. Scapulars not freckled with brown as in the White-eye. White of the abdomen not so well defined or sharply marked off from the breast. The feathers forming the white speculum-patch are distinctly edged with black on the outer margin.

Iris white or nearly white. Bill black. Legs and feet black.

Wing 190–195 mm.; tarsus 33–37; bill 38–44.

FEMALE: Similar to the male. Soft parts same color as in male. Size equal to male.

YOUNG IN FIRST (JUVENAL) PLUMAGE: Very similar to the first plumage of the White-eyed Duck, but darker on the mantle and scapulars. The under surface is silvery white mixed with gray and merging into grayish brown on the lower abdomen. Irides nearly white according to the field notes of Mr. F. R. Wulsin, who collected the five specimens which are now in the Museum of Comparative Zoölogy.

YOUNG IN DOWN: Undescribed.

DISTRIBUTION

THIS species is confined to Madagascar, where it does not appear to be common. Specimens have been taken in Betsileo (British Museum), between Foulepoint and Lake Alaotra and on the Sahabe River (Milne-Edwards and Grandidier, 1876–81; Bangs, 1918).

GENERAL HABITS

NOTHING is known about this duck in its native haunts. It is almost certainly closely related to the Common White-eyed Duck and probably greatly resembles it in its mode of life. It does not seem to be common but Mr. F. R. Wulsin, who collected in Madagascar in 1915, was fortunate in obtaining five adults in the eastern parts, which are now in the collection of the Museum of Comparative Zoölogy. No field notes were made. It seems only to be known from the north and east of the island.

BAER'S POCHARD

NYROCA BAERI (RADDE)

(Plate 60)

SYNONYMY

Anas leucophthalmos Kittlitz (*nec* Borkhausen), Oken's Isis, p. 529, 1829.

Anas (Fuligula) baeri Radde, Reise Sud O.-Siberia, vol. 2, p. 376, pl. 15, 1863.

Aythya ferina Swinhoe (*errorim*), Proc. Zool. Soc. London, p. 419, 1871.

Fulix baeri Swinhoe, Proc. Zool. Soc. London, p. 419, 1871.

Fulix cristata G. R. Gray (in part), Hand-list Birds, vol. 3, p. 86, 1871.

Fuligula nyroca David (*nec* Güldenstädt), Nouv. Arch. Mus. d'Hist. Nat. Paris, Bull. 7, cat. no. 354, 1871.

Fuligula baeri Dybowski, Journ. f. Ornith., vol. 22, p. 337, 1874.

Fulix nyroca David and Oustalet (*nec* Güldenstädt), Oiseaux de la Chine, p. 507, 1877.

Nyroca ferruginea Blakiston and Pryer (*nec* Gmelin), Trans. Asiatic Soc. Japan, vol. 10, no. 1, p. 99, 1882.

Fuligula baueri Tristram (*errorim*), Cat. Coll. Birds, p. 48, 1889.

Nyroca baeri Salvadori, Cat. Birds British Mus., vol. 27, p. 344, 1895.

VERNACULAR NAMES

English: Baer's White-eyed Duck, Baer's Pochard or Duck, Eastern White-eyed Duck, Siberian White-eye, Green-headed Pochard.

German: Baers Ente, Baers Moorente.

French: Fuligule de Baer.

Japanese: Akahajiro, Hisuigamo.

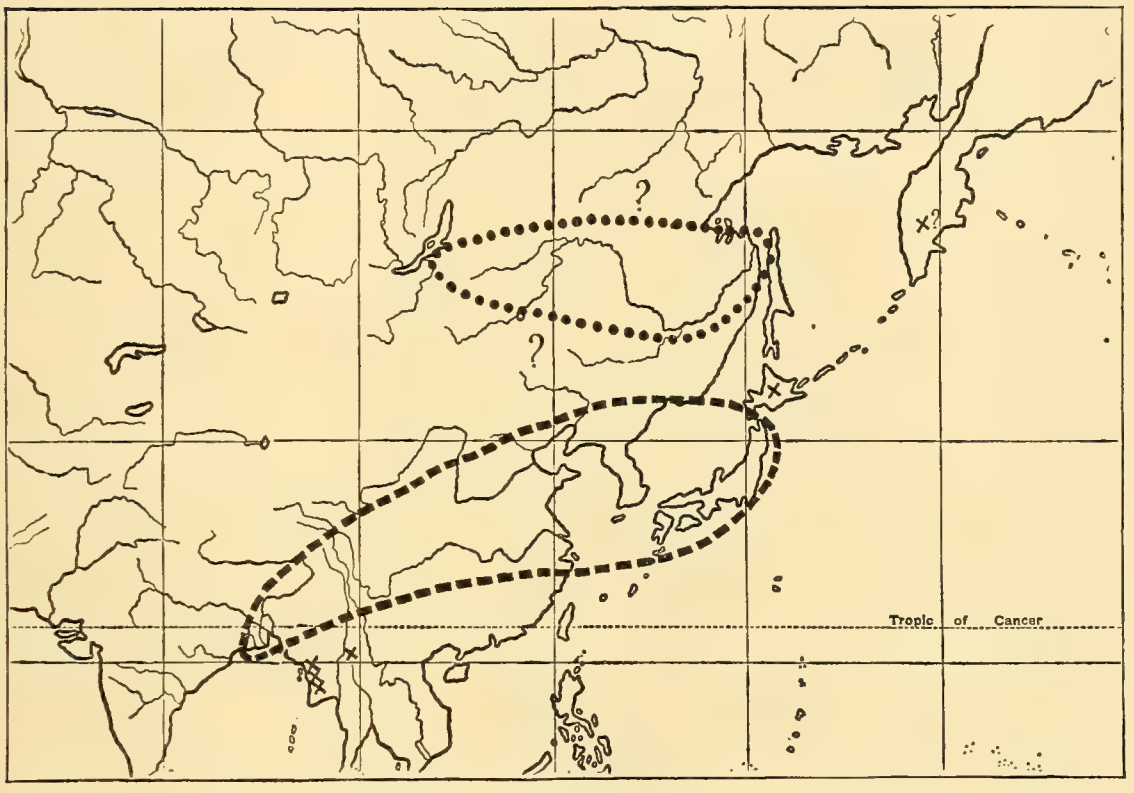
Cachar: Boro lalbigar.

DESCRIPTION

ADULT MALE: Head and neck dark metallic green except on the lower neck where the color becomes a dead black. There is a small white spot on the chin. The mantle is black down the middle, but on the sides it is ruddy chestnut like the breast. Scapulars very dark brown, indistinctly speckled with very fine brown dots. Back, rump, upper tail-coverts and tail, black. Breast ruddy chestnut running into brown on the sides and flanks. Abdomen pure white sharply contrasted with the breast color, except the lower part which shades into a brownish color. Under tail-coverts white; outer wing-coverts black; speculum white, but framed posteriorly by a black band formed by the tips of the secondaries. Primaries dark brown on the outer web and tip, pearl gray on the inner web. Tertials black, marginal under wing-coverts dark brown, remainder of under wing-coverts white like the axillars.

Iris white; occasionally yellowish or pale yellow. Bill bluish to slate blue with the base and the nail black, the blue color lighter toward the tip. Feet and legs lead-gray with the joints and webs darker.

Wing 210–223 mm.; bill 49; tarsus 37.



MAP 84. Distribution of Baer's Pochard (*Nyroca baeri*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

ADULT FEMALE: Similar to the male but head and neck less glossy; a chestnut patch on the anterior part of the face, near the base of the bill; upper breast of a duller chestnut, dark brown, without narrow wavy lines; brown base of the abdominal feathers more extended (Salvadori, 1895). The eye is said to be darker than in the male (Finn, 1901), gray or brown. Perhaps it is white in old females (Baker, 1921). The bill and feet are not so bright in color as in the male.

IMMATURE, both sexes: Very similar to adult females.

MALE IN ECLIPSE: Males in captivity did not "go off" in color to any appreciable extent according to Finn (1901). In another place (1909) he says that his males in "undress" assume the rusty facial patch and get some white mottling on the breast. At this time also the white appears to "fade" off the flanks in both sexes.

DOWNY YOUNG: Not examined.

DISTRIBUTION

A VERY few words will suffice to tell what is known of the distribution of this duck. It is probably not so rare a bird as our meager data would suggest, because it must often have been overlooked on account of its resemblance to the Common White-eyed Duck. It appears to have been found in 1825 in Kamchatka by Kittlitz (Oken's Isis, 1829, p. 529) but no more recent investigators seem to have met with it there. We know nothing of its summer status excepting that it has been found in eastern Siberia, in southern Dauria (Transbaikalia), at the mouth of the Ussuri and on the Amur (Taczanowski, 1893) and on the Udir and the right bank of the middle Amur (Radde, 1863). The species is said to occur in Yezo (Seebohm, 1890), but whether in the breeding season or only in winter is not clear. One specimen was taken in Manchuria on May 15 (Bianchi, 1902).

Kamchatka

Eastern Siberia

Japan

China

In winter it is found in parts of China, and is particularly common about Peking (David and Oustalet, 1877; H. A. Walton, 1903). It is irregular and not very common on the lower Yangtse (Styan, 1891) though specimens have been taken at Kinkiang and Shanghai every winter (David and Oustalet, 1877; British Museum). La Touche (1922) got one in the Shasi market in Hupeh Province of China in late February while Mr. E. H. Wilson told me of seeing the species on the Tung River around Kiating-fu in Szechuan. Kuroda (1918) has recorded it for Korea, and examples have also been taken near Foochow (La Touche, 1917; Kellogg, 1919). In Japan it is found on the main island and south to Yokohama (Seebohm, 1890), but, as Mr. Kuroda writes me, it is never anything but a very rare visitor in his country. As identification of females and immature birds is not easy it is possible that most of the records of the Common White-eye in eastern China and Japan really refer to Baer's Pochard.

Japan

Finn (1909) has shown that this species has occurred in northwestern India as long ago as 1825, and he has carefully noted specimens taken since 1896. It appears that the species may be found each year in Bengal, and that it has been procured also in Cachar, Sylhet, Manipur, Burma and Arakan (Hopwood, 1912; Baker, 1921). H. J. Walton (1906) says he inspected large numbers of ducks in southern Tibet both in summer and in autumn and saw no trace of this species.

India

Burma

It remains to note two occurrences of this Pochard in England: one a young male taken on November 5, 1901, on the Tring Reservoir (Hartert and Jourdain, 1920) and one taken on the Trent River, Nottinghamshire, in the middle of April, 1911 (J. Whitaker, 1913). Since the species has not been commonly kept in England or on the Continent and since no loss was reported, it seems that the first of these two specimens, at least, may have been a wild bird.

England

GENERAL HABITS

Less is known of this duck than of any other of the northern diving ducks. The species is evidently closely allied to the White-eyed Pochard and perhaps to the Australian White-eye, but it is a larger and heavier bird than the former species with a longer and wider bill. When further investigations are made, and the center of distribution is known, it will probably turn out to be a not uncommon bird. On the middle Amur, Radde (1863), who gave the first good description of it, found it in small companies during the breeding season. There seems to have been an invasion of India in February, 1896, and also the following winter. Most of these were young birds. In the winter of 1899–1900 only six were seen but in 1901 more again appeared in the markets. In 1902 none was reported (Finn, 1909). Baker (1921) thinks that Baer's Pochard will eventually prove to be a regular and not uncommon visitor to the northeastern parts of India and even to northern Burma.

In its general habits, so far as known, this duck resembles the White-eyed Duck. Finn (1901), basing his observations on captive birds in the Alipore Zoölogical Gardens, thought that it rose on the wing more easily than other diving ducks, being comparable to the surface-feeders in this respect. Baker (1921) thus describes the taking of one in the North Cachar Hills, India: "The bird was one of a flock of about a dozen or less which were sighted flying up stream on the River Diyang, a mountain stream consisting of rushing rapids and deep, still pools of water in alternation. We followed them up and found the birds in a deep, but very rapid narrow, which in one place widened out and made an eddying pool on either side, in which the ducks were swimming. On our approach they got up, but Mr. Kennedy fired and knocked one over; it was only winged and fell into the torrent, leading us a pretty dance before we eventually secured it. The great pace of the water seemed to have no appreciable effect on it, either in diving or in swimming, for it dashed backwards and forwards with the greatest ease, kept long under water and turned and twisted with great agility. At last a snap shot, as it showed itself for a moment, brought it to hand." This bird, when eaten, proved to be extremely rank and fishy, so much so that it could not be kept on the table.

Two of Baker's collectors told him that this duck is a faster, stronger bird on the wing than the Common White-eye, an equally good diver and swimmer, and much more shy and wary.

The courtship of this duck was first described by Frank Finn (1897, 1898). Later Millais (1902a) made some observations on a specimen in the London Gardens. He compares the courtship to that of the Common White-eye, and says he never saw it throw the head back on the shoulders as the Common Pochard does. The male half raises himself in the water by a sudden movement, while at the same time the chest is thrust forward and the head and neck depressed upon the scapulars. Whilst this

quick movement is being performed the wind-pipe (neck) is blown out to the fullest extent and then the air is released. This part of the display is common to both the Pochards and the Scaups. When much excited the bird was seen to contract the pupil of the eye till it was almost lost to view. Another attitude (Millais, 1913) assumed also by the drake of the White-eye, is to throw the head up and back and also to stretch the neck to its fullest extent, with the head held horizontally, and blow it out with air.

Few nests have ever been found. According to Dybowski and Godlowski (*fide* Taczanowski, 1893) they are placed on the shores of lakes or along the banks of streams. The size of the clutch is not known, but an egg described by Baker (1921) is a very dirty dull-colored drab without gloss and with a texture exactly resembling that of the Common White-eye, from which it differs only by its larger size. The measurements of five eggs show a maximum length and width of 55 and 39 mm. respectively, and minimum of 51 and 38 mm. (Hartert 1920a). The incubation period is not known and the young in down has never been described.

Finn (1909) noted that in India this bird, when kept in confinement, stands the heat less well than the Common White-eye.

In 1906 the London Zoological Gardens received five specimens of this duck from Mr. Finn. Of these one lived three years and eleven months, the average length of life for all being one year and nine months (P. C. Mitchell, 1911).

While visiting Mr. Wormald in Norfolk, in the spring of 1922, he told me that seven or eight years before he had obtained several pairs of this Pochard from Mr. Jamrach in London. Evidently the dealer had confused them with Common White-eyes, for he let them go at a very low price. Mr. Wormald did not keep the birds for any length of time, but resold them to the Duke of Bedford and to Mr. St. Quintin. A few days later I saw Mr. St. Quintin's collection in Yorkshire and he showed me a single old male which was the surviving member of the pair which he had received from Mr. Wormald. The female had died some time before and had never shown any signs of breeding. The male was still in splendid plumage, but was very wild. He must have been over eight years old, a good age for any diving duck in confinement.

So far as I know the species has never been kept in continental collections and in the United States I happen to know of only one, now in the collection of Mr. J. V. De Laveaga in California. I know of no hybrids.

AUSTRALIAN WHITE-EYED DUCK

NYROCA AUSTRALIS EYTON

(Plate 61)

SYNONYMY

Nyroca australis Eyton (*ex* Gould MS.), Monograph Anatidæ, p. 160, 1838.

Fuligula australis Schlegel, Mus. Pays-Bas, Anseres, p. 30, 1866.

Aythya australis G. R. Gray, Genera Birds, vol. 3, p. 87, 1871.

Anas australis Giebel, Thesaurus Ornith., vol. 1, p. 345, 1872.

Ilyonetta australis Heine and Reichenow, Nomencl. Mus. Heineanum Ornith., p. 347, 1890.

Nyroca baeri Rothschild and Hartert (*nec* Radde), Novitates Zool., vol. 1, p. 684, 1894.

Nyroca nyroca australis Mathews, Novitates Zool., vol. 18, p. 239, 1912.

Nyroca nyroca dampieri Mathews, Austral Avian Record, vol. 1, p. 87, 1912.

VERNACULAR NAMES

English: Australian White-eyed Duck, White-winged Duck, White-wings, Hardhead, Wigeon.

German: Australische Moorente.

French: Fuligule australe.

Aborigines of Australia: Bubbuloo, Punkery (South Australia); Erroodoo (West Australia); Buel-bun-bun-loot (Port Essington); Garrut (Victoria).

Maori: Karakahia.

DESCRIPTION

ADULT MALE: Head and neck dark chestnut brown. Mantle, scapulars, back, rump, upper tail-coverts and tail dark rich brown. Breast chestnut-colored, but lighter than the head. Abdomen white anteriorly, shading into brown on the lower part. Sides and flanks brown, under tail-coverts white. Outer wing-coverts olive brown, speculum white, framed posteriorly by a wide black and then by a narrow white bar at the extreme tips of the secondaries. Primaries dark brown on the outer webs and tips, white on the inner web. Tertials dark brown. Under wing white except the marginal coverts which are brown and white. Axillars white.

Iris white. Bill black with a broad blue-gray band at the tip; nail black. Legs and feet gray to light gray with the joints and membranes darker.

Wing 225 mm.; bill 47; tarsus 41.

Weight 2 pounds (0.90 kilograms) (Berney, 1907).

ADULT FEMALE: Similar to the male but slightly smaller and with very little chestnut on the head and neck, which are brown.

AUSTRALIAN WHITE-EYED DUCK

Male Female

SOUTHERN POCHARD

Female Male

IMMATURE MALE: According to Buller, has the chestnut-brown color much lighter, and the feathers of the back margined with pale brown; it has also less gloss on the head, and the brownish white of the under parts is mottled with brown.

IMMATURE FEMALE: A plain, brown-colored duck almost exactly like the Common Scaup in appearance. It lacks all trace of the white face-patches which are nearly always to be seen in the young female Scaup, and it can always be distinguished even in dried skins by the dark bill, banded across the tip with lighter color.

YOUNG IN DOWN: Not seen.

Note: A male specimen in the U.S. National Museum collected in Celebes is rather darker and richer in color than the few Australian examples there. It is perhaps only a fresher and less-faded specimen.

There are no notes available on "off-season" plumages, but it is doubtful whether there is any pronounced eclipse dress.

DISTRIBUTION

THE Australian White-eye is one of the most common and widely distributed species of the island continent, the range extending also over several of the neighboring archipelagos. Like all Australian ducks it is resident, its migratory movements being local and depending entirely on rain conditions.

In West Australia it is everywhere a fairly common bird. W. B. Alexander (1916) saw several in January on the south coast near Bremer Bay. In the interior it is not so abundant at Moora (Orton and Sandland, 1913), but many were seen in the Wongan Hills (Milligan, 1904) and it is a fairly common resident and breeding bird in the vicinity of Perth (W. B. Alexander, 1921; H. E. Hill, 1904). It is abundant at Lake Way (North, 1898) and in the Northwest Cape region is said to be the commonest duck, excepting the Slender Teal (Carter, 1904). Still farther north it is very abundant along the Fitzroy River (North, 1898).

West Australia

Hartert (1905) has recorded specimens taken near the South Alligator River, North Territory, in November, but Gould (1865) states that it is a very rare bird at Port Essington. In the eastern part of the North Territory it was fairly common on the lagoons along the M'Arthur River (Barnard, 1914) and was met with in the interior about Alexandra Station in July (Ingram, 1907) and on the Brunnette Downs (Barnard, 1914) as well as farther south in the Harts Mountains about Alice Springs and Owens Spring (North, 1913).

North Territory

In western Queensland it is common along the Gulf of Carpentaria and along the Leichhardt River, breeding at Byromine (Macgillivray, 1914). At Richmond, in the interior, it is far from common (Berney, 1907). Castelnau (in North, 1913) has recorded it from the Norman River, and in the north a few were seen on the swamps along the Watson River (Macgillivray, 1918). It is common in the east near Coomooboolaroo (Barnard, *in litt.*) and on the Herbert River (Broadbent, 1910), and was found breeding in southwest Queensland at Cunnamulla (Robinson, in North, 1913).

Queensland

In New South Wales it is locally common, especially in the western parts. Savidge (in North, 1913) found it the commonest duck on the Clarence River and Austin (1907) records great flocks on the Talbragar River during the rains. In the northwest it is common and breeds (d'Ombrain, 1921) and at the junction of the Darling and Murray Rivers great flocks were observed (W. B. Alexander, 1918). Smaller numbers have been reported from the Mudgee district (Cox and Hamilton, 1889), from the Mossgiel district (Bennett, in North, 1913) and from Cobbora (Austin, *ibid.*).

New South Wales

Victoria The species apparently is less common in Victoria, excepting on Lake Boga, where it is said to be abundant and to breed (A. C. Stone, 1912). Barrett (1920) met with it on Wilson's Promontory, and F. E. Howe (1910) as well as Chandler (1920) have reported it from northwestern Victoria.

South Australia On the lower Murray and about Lakes Alexandrina and Albert, South Australia, it is a well-known bird (S. A. White, 1914a; Mellor, in Mathews, 1914–15; Belchambers, *in litt.*). It has been reported from Balah (Sandland, in Mathews, 1914–15) and from Port Lincoln (North, 1913). Mr. Reese writes me that it breeds near his place at Marree in the interior, but S. A. White (1914) states that it is not common in the interior. He saw only a few at Dalhousie Springs and Lindsay Creek. He also noted some in the Gawler Ranges (S. A. White, 1913).

Tasmania Gould (1865) describes it as a common bird in Tasmania and Legge (1905) found it abundant on Great Lake and along the Derwent, breeding near Bridgewater. According to Littler (1910), however, it is a comparatively scarce bird, occurring chiefly along the Derwent.

New Zealand **Auckland** It is by no means a common species in New Zealand, occurring on the North Island along the lower Waikata, where it breeds, and on Lake Rotomahana (Hutton, 1870; Buller, 1888). On the South Island it has been found on Lake Ellesmere and about Canterbury, as well as on Lake Wairarapa, Otago (Buller, 1888, 1905). Hutton (1870) found it not uncommon in the interior of Auckland Island.

Melanesia The Leyden Museum possesses specimens of this species taken by Marie on New Caledonia and one was taken on Espiritu Santo in the New Hebrides (Sarasin, 1913). The northwesternmost records of its occurrence are those for Arfak (northwestern New Guinea) and Waigiu (Rothschild and Hartert, 1894), and for Lindoe Lake, Paloe district, western Celebes, where Mr. H. C. Raven took a specimen on March 26, 1917, now in the United States National Museum.

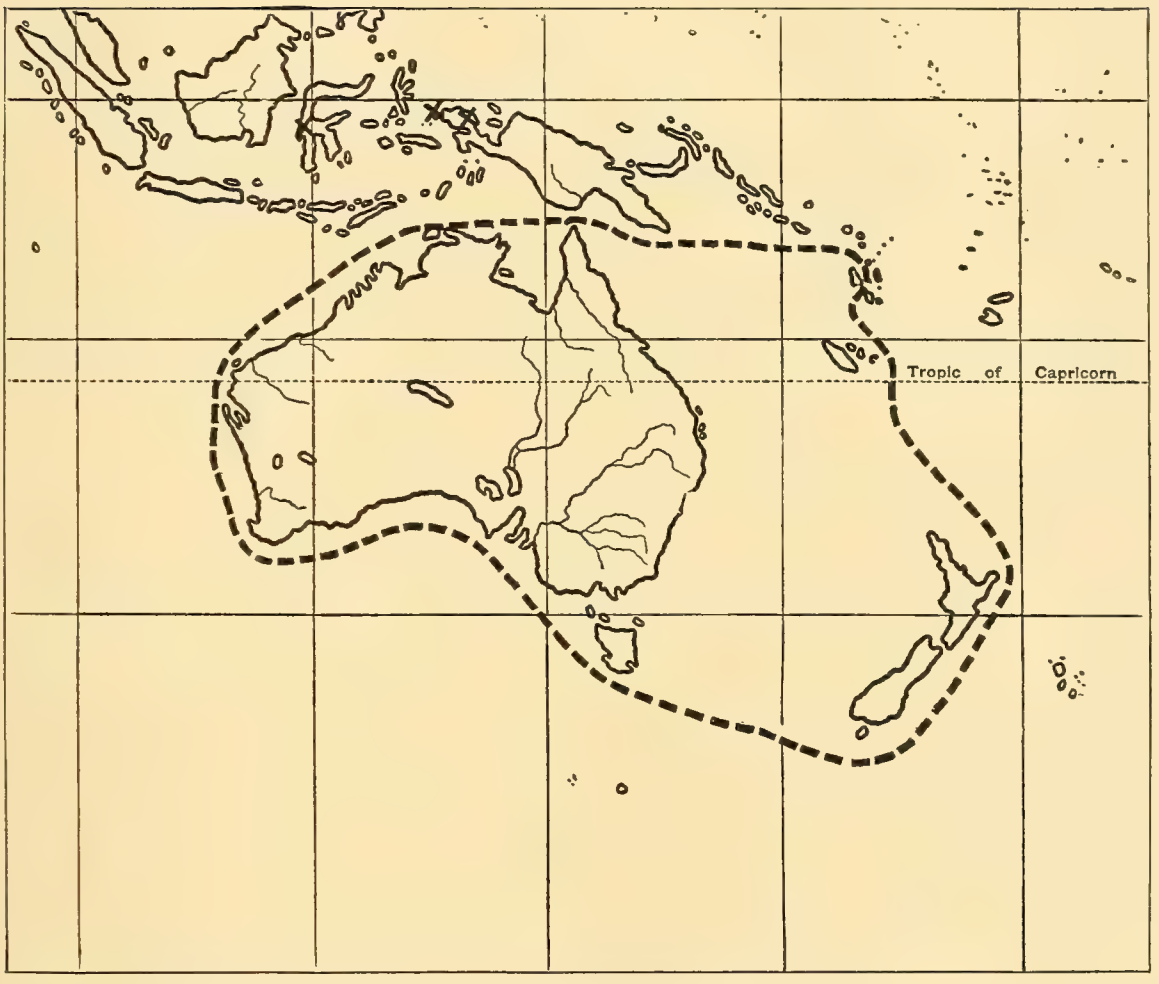
GENERAL HABITS

This close ally of the European White-eye is one of the commoner game ducks of Australia, and is scattered all over the continent, wherever fresh-water pools exist. It is said to prefer timbered lakes (R. Hall, 1909) and is seldom seen on rivers or creeks except, of course, on their back waters (Hutton, 1870), and even less often on salt water.

Wariness. Many field naturalists have remarked on its shyness. Berney (1907) speaks of it as shy, and Bennett (in North, 1913) terms it an "exceedingly shy and wary bird and very difficult to approach." Hutton (1870) makes the same observation for New Zealand. Austin (in North, 1913) says that "they are very wild birds, fly at a great height and when disturbed usually fly straight away for miles, not returning to their favorite feeding grounds till night."

Daily Movements. No particular observations have been made on this point. I presume that it is a day feeder, like its relatives, at least where undisturbed.

Swimming and Diving. When resting on the water it sits lightly, like others of its kind, but it is also able to sink deep in the water when alarmed or when engaged in feeding. It is an exceedingly expert diver and is said to get most of its food



MAP 85. Distribution of Australian White-eyed Duck (*Nyroca australis*)
Sporadic records indicated by crosses (×)

from the bottom (White, in Mathews, 1914–15; Savidge, in North, 1913). It keeps to moderately deep lakes rather than to shallow pools.

Flight. It seems to resemble its palæarctic relative, the Common White-eye, in going about in pairs or small flocks of from six to eight individuals, though it is on occasions seen in larger aggregations, numbering perhaps a hundred or more.

Association with other Species. There seems to be great difference of opinion in regard to the sociability of these ducks. Bennett (in North, 1913) says he found them generally alone, and Legge (1905) remarked that even when feeding with other species the White-eyes stayed in a separate group. On the other hand, Gould (1865) states that in New South Wales they are seen together with the Pink-ears and Shovellers, while Keartland (in North, 1898) speaks of them as often in the company of other ducks, especially of the Gray Teal. R. Hall (1909) found them feeding in the company of the Australian Coot.

Voice. There are no satisfactory notes on the voice. Observations such as: "A loud squawk is their signal to rise quickly" (R. Hall, 1909), are scarcely worth copying.

The trachea has been referred to by Ramsay (1878) as having a large *bulla ossea*, but he says nothing as to the shape.

Food. If one may judge by the scattered observations which have appeared in the literature, it takes a large proportion of animal food, perhaps even a preponderance. Of course such observations are frequently misleading, because the large and obvious animal remains, the shells, insects and crustaceans, are easily identified, while masses of partly digested vegetable matter which surround them are difficult to analyze and may be lightly brushed aside and ignored.

Their habit of taking advantage of the shrimp-stirring activities of the Coots has already been mentioned (R. Hall, 1909). Shrimps together with mussels, form an important part of the diet. They have been found bolting live mussels fully an inch long (Ramsay, 1867), while water-beetles, small broken shell-fish, grass or plant fibers, and in one case six two-inch carp, have been found in the stomachs (F. C. Morse, 1919a; Berney, 1907; S. A. White, 1913).

Courtship and Nesting. About the nesting season we know nothing. No doubt it is as irregular as with other Australian ducks. At Mallacoota Inlet, S. A. White (1915) saw a pair with fully fledged young of the year in November.

The nest is said to be placed in isolated clumps of rushes close to the surface of the water (d'Ombrain, 1921), and along the margins of lakes in New Zealand (Hutton

and Drummond, 1905). According to Campbell (in Mathews, 1914–15) and Macgillivray (1914) they sometimes nest in hollow trees, but I feel that more convincing observations are necessary before these statements can be accepted. None of the White-eyes, so far as I know, has been found to nest in any such situation. F. C. Morse (1922) writing of the Moree district of New South Wales says that they build in a tussock of reeds or grass in the water and often make use of a Coot's or Moor-hen's nest.

Very few nests have been described, but clutches of 14, 16, and even 26 eggs have been recorded (A. C. Stone, 1912; Mellor, in Mathews, 1914–15), probably the work of two females. The clutch of 26 was found by Mr. L. Reese of Minnie Downs, South Australia, in 1920. This was a flood year, during which the ducks bred in unusual numbers and the clutches of all of them were much larger than is usually the case. Nine eggs must be close to the average. The eggs are dull creamy white, and measure 2.15 to 2.35 inches (55 to 60 mm.) in length and 1.64 to 1.67 inches (41.5 to 42 mm.) in breadth (Campbell, in Mathews, 1914–15; North, 1913). They are smaller than those of the Australian Black Duck and larger than those of the Teal. The nest-down is described by Campbell as brownish gray or grayish brown, with light tips and whitish center. The incubation period is unknown. Neither is it known whether or not the male stays with the female after the young are hatched.

Status. Undoubtedly one of the commonest of the Australian ducks, outranked by only a few species, like the Black Duck and the Gray Teal, this bird has its usual center of abundance in western Australia and New South Wales. In other parts of Australia it is irregular in its appearance, turning up, sometimes in great numbers, during flood years, when very likely its regular quarters are suffering drought. A. C. Stone (1912) speaks of it as very common on Lake Boga, Victoria; and at the junction of the Murray and Darling Rivers W. B. Alexander (1918) found very large flocks. Keartland (in North, 1898) describes it as very common on the Fitzroy River, northwestern Australia, and at the Northwest Cape, Carter (1904) considered it the commonest duck next to the Gray Teal. It is hardly likely that it is as numerous now as it was twenty years ago for great changes have taken place in Australia, not only an increase of human population, but a rapid spread of introduced mammal and plant pests.

In Tasmania it is moderately plentiful, and on the Derwent River it is one of the commonest ducks. More are shot for the Hobart Market than Black Ducks (Legge, 1905).

Even in Buller's (1888) time this was an uncommon bird in New Zealand. From what I can gather concerning other New Zealand birds I presume that it is even rarer now than it used to be. Hutton and Drummond (1905) say that they used to be very abundant at Lake Rotomahana, but that most of them seem to have been destroyed by the eruption of Tarawera in 1886.

Enemies. The enemies of Australian ducks have been discussed in some detail in the account of the Australian Black Duck. There is nothing particular to add here, beyond a note by White (in Mathews, 1914–15), who says that he found 90% of these ducks containing tape-worms, some yards and yards of them. The introduced fox, weasel, cat, brown rat and other mammals are destructive to nests and sitting birds. The frequent brush fires are mentioned as an important factor in the decrease of many ground-nesting birds and it is possible that these may prove disastrous to some ducks, especially those that nest at a little distance from water.

Food Value. Evidently this is considered a fairly good bird in Australia, for it brought from 4 to 6 shillings the pair in the Sydney Market thirty-five years ago (Ramsay, 1876a). In the market of Hobart, Tasmania, Legge (1905) found them even more plentiful than the Black Duck. Austin (in North, 1913), writing of New South Wales, says these ducks vary much in the quality of the flesh: "I have known them shot at certain lagoons from which they are anything but a good eating bird, from other lagoons they are equal to the best of ducks, and yet we could not notice any difference in other species of ducks from the same waters."

Hunt. Australian sportsmen seem to consider this duck a very difficult shot for a novice. Dense plumage, rapid flight and expert diving make them good sporting birds.

Behavior in Captivity. This species has never been imported alive into Europe or America. Mr. D. Le Souef, writing from Melbourne, tells me that he has kept them there in the Gardens, but that they have never bred.

Hybrids. I have been unable to find any records of hybrids with this duck.

SOUTHERN POCHARD

NYROCA ERYTHROPHTHALMA (WIED)

(Plate 61)

SYNONYMY

Anas capensis Lesson (*nec* Gmelin), Traité d'Ornith., p. 632, 1831.

Anas erythrophthalma Wied, Beiträge z. Naturg. Brasil., vol. 4, p. 929, 1832.

Fuligula capensis Smith, Cat. South African Mus., p. 36, 1837.

Nyroca brunnea Eyton, Monograph Anatidæ, p. 161, pl. 23, 1838.

Fuligula mariloides Blyth (*nec* Yarrell), Journ. Asiatic Soc. Bengal, vol. 12, p. 180, 1843.

Nyroca capensis Pucheran, Revue et Mag. Zool., ser. 2, vol. 2, p. 548, 1850.

Aythia capensis Bonaparte, Comptes Rend. Acad. Sci. Paris, vol. 43, p. 651, 1856.

Fuligula brunnea Gurney, Ibis, ser. 1, vol. 6, p. 355, 1864.

Fuligula nyroca A. Chapman (*nec* Güldenstädt), Travels in South Africa, appendix, p. 423, 1868.

Fuligula nationi Sclater and Salvin, Proc. Zool. Soc. London, p. 522, 1877.

Fuligula meridionalis Hartert, Katalog Vogelsamml. Mus. Senckenberg. Naturf. Ges., p. 233, note, 1891.

Aythya capensis Shelley, Ibis, ser. 6, vol. 6, p. 478, 1894.

Nyroca nationi Salvadori, Cat. Birds British Mus., vol. 27, p. 353, 1895.

Nyroca erythrophthalma Salvadori, Cat. Birds British Mus., vol. 27, p. 353, 1895.

VERNACULAR NAMES

English: Southern Pochard, Brown Pochard, South African Pochard, Nation's Pochard, Red-eyed Pochard, Cape Pochard.

German: Braune Tafelente, Afrikanische Tafelente.

French: Fuligule d'Afrique, Fuligule aux yeux roux.

Dutch: Bruine Eend.

Spanish: Pata.

Rhodesian Natives: Choso, Idada.

DESCRIPTION

ADULT MALE: Head and upper neck black with a purple or coppery gloss; sometimes there is a white spot on the chin. Mantle black, scapulars black, very finely freckled with dark brown. Back, rump, upper tail-coverts and tail black, with some freckling on the upper back. Lower neck and breast black with iridescent sheen. Abdomen and under tail-coverts brown-black, without the iridescence

of the breast, but with very obscure light-colored transverse barring. Sides and flanks rich, dark brown. Outer wing-coverts black, somewhat freckled like the scapulars. Secondaries with a white patch at their bases and the outer edge of each feather with a distinct black line. Ends of secondaries black to a depth of 22.5 mm. Primaries black on the outer web and at the tip, and brown on the inner web. Tertials black. Under surface of wing dark brown.

Iris bright orange or even crimson, fading to yellow soon after death. My notes on Uganda specimens in the breeding season, give color as carmine. Bill blue, but not so bright and light as in the Greater Scaup and a little mottled along the edges and culmen with dusky edge of the culmen color of whitish putty, but a little yellow-buff in tint (L. A. Fuertes, *in litt.*). Legs and feet leaden gray to pale olive, darker on the joints and posterior tarsus; webs dark.

Wing 210–221 mm.; bill 42–45; tarsus 37–41.

Weight of males in southwestern Uganda in April, 1 pound, 12 ounces to 2 pounds, 4 ounces (0.71 to 1.02 kilograms).

Note: Full-plumaged, freshly moulted males in the black, glossy state are scarce both in birds from South America and from Africa. Out of twenty-seven males mostly from Africa in the British Museum only three are what might be called perfect (black). All the rest are dirty brown both above and below, or are black only on the upper side. Lord William Percy thinks that in all those individuals that moult in the dry season the plumage immediately fades. Hence we must have old birds that have moulted during the rains to get the "all-black" specimens. From South America I have only seen five or six males that are "perfect." In Uganda in 1924, I shot several old males, one of which is nearly black all over. I saw others that seemed to be even blacker, so that I do not doubt that African specimens get just as dark as South American ones.

Adult Female: Pileum very dark brown with the upper surface of neck brown. Sides of head reddish brown with an irregular white area at the base of the culmen, behind the eyes and on the chin, throat and lower neck. Mantle, scapulars, back, rump and tail very uniform dark brown. Upper breast dark brown; flanks and sides bright rusty brown. Abdomen much lighter than breast, having a silvery-white appearance, darker posteriorly. Wing almost as in the male.

Iris dark chocolate-color. Bill dull lead-color with a bright blue band at the tip; nail black. Legs and feet as in the male.

Wing 200–212 mm.; bill 42–45; tarsus 37–40.

Weight in Uganda, in spring of 1924, 1 pound, 14 ounces to 2 pounds, 3 ounces (0.85 to 0.99 kilograms). The females seem to be nearly as heavy as the males.

Female in First (Juvenal) Plumage: Closely resembles the adult female. The whitish face-patches, especially the throat-patch and post-orbital white streak, are less well developed.

Male in First (Juvenal) Plumage: At first almost exactly like the adult female, with the lower parts light-colored and the white face-pattern present. The mantle and scapulars are, however, somewhat darker and richer in tone and the light-colored freckling is present on the mantle and scapulars. Later on, black feathers begin to appear on the occiput, face and throat, and from this time on the sexes are very easily distinguished.

Moults are evidently very irregular and there is no indication of a definite eclipse plumage. The iris probably does not become red until the bird is sexually mature.

Young in Down: Not seen. Sjöstedt (1910) gives the appearance of young in down and early feather stages, but the description does not mean much for purposes of comparison.

Note: Confusion in the distribution of this duck has arisen chiefly because immature or faded specimens, which are much commoner in collections than adult males, have been compared with old birds in fresh plumage. Thus it has been maintained (F. M. Chapman, 1917) that adult South American examples are always darker than the darkest of African specimens. I cannot agree to this for I have examined and either carefully compared or made notes upon all specimens in the American Museum of Natural History at New York, the U.S. National Museum in Washington, the Philadelphia Academy of Sciences, the British Museum, and the collection at Tring. In other words, although I was at first inclined to the opinion that South American males were slightly different in color about the sides of the head (darker and richer), I have recently found specimens in England which were as nearly as I could see indistinguishable. But in comparing specimens from the two continents it is very necessary to pick only the blackest and freshest-plumaged birds. The others present all tones from faded brown to deep, rich, dark chestnut. In Uganda in April, 1924, I shot a number of these ducks and saw many more and I feel quite certain that all-black specimens are not as rare in Africa as one would think from specimens in collections.

As to the Wied types from Lagoa do Braco, southern Brazil, which are now in the American Museum of Natural History at New York, they are merely old faded specimens which have nothing characteristic in their measurements and are too old to retain much of their original coloration. One, a male, was probably not in adult plumage when taken, and has shed his primaries. The other, a female, is in better plumage, but perhaps even more faded than the male. This specimen may not have been in full adult plumage either, for the whitish areas at the base of the bill and on the chin and throat are not as clearly defined as they should be. Taking everything into consideration I have merely followed Salvadori's (1895) suggestion when he said, "It seems extremely likely that the Brazilian *N. erythrophthalma* (Wied), the Peruvian *N. nationi*, and the African *N. brunnea* are one and the same species," etc.

DISTRIBUTION

Like the Fulvous and the White-faced Tree Ducks, the Southern Pochard has a very peculiar distribution, for it is found chiefly in eastern Africa and in western South America. There seems no longer to be any doubt that specimens from these widely separated areas belong to the same species. Like many tropical ducks, it may be regarded as essentially non-migratory, though in Africa it may withdraw from the extremities of its range in the cold season, and it moves about according to the wetness or dryness of the country.

In eastern Africa specimens have been taken as far north as Lake Haddo, Shoa, Abyssinia, in May (Salvadori, 1884). To the southward it is a common bird on some of the lakes of British East Africa (B. Horsbrugh, 1912; V. G. L. van Someren, 1916), particularly Lakes Naivasha and Nakuru (Bannerman, 1910; V. G. L. van Someren, 1922; W. Stone, 1906). Hinde (1898) found it at Machakos in April and October, and Salvadori (1914) has reported it from Victoria Nyanza. It is a common bird in western Uganda, especially in the Ankole district and about the Ruwenzori Range (Ogilvie-Grant, 1905a; F. J. Jackson, 1906; V. G. L. van Someren, 1916). I saw a great many on the lakes of the Kigezi district, extreme southwestern Uganda, in the spring of 1924. The farthest northern record seems to be that of a specimen sent in alive from Um Ruaba, Kordofan, Sudan, to the Zoölogical Gardens in Cairo (Flower, 1921).

Africa
Abyssinia
British East Africa
Uganda
Sudan

It appears to be a less well-known bird in what was formerly German East Africa. It is true that the Swedish Expedition found it very abundant on the Natron Lakes and met with it during the whole year in the Kilimandjaro-Meru region (Sjöstedt, 1910), but Schillings (1905) did not find it at all common on the Merker Lakes, and the only two other records for this region are for Tanganyika (Dubois, 1886a) and Kibaya-Massai (Neumann, 1898).

Tanganyika Territory

The British Museum possesses specimens taken at Lake Bangweola, northern Rhodesia. Neave

MAP 86. Distribution of Southern Pochard (*Nyroca erythrophthalma*)
Sporadic records indicated by crosses (×)

(1910) found the species rare in that region, where it has also been taken on Lake Abercorn (Salvadori, 1914), and at Feira (Stoehr, *fide* Stark and Sclater, 1906). In the neighboring Katanga district of the Congo it is also rare (Neave, 1910), while in the Mangwe and Matopo districts of southern Rhodesia it is irregular in its appearance (Mouritz, 1915). In British Central Africa, on the other hand, flocks have been seen in April and June along the upper Shiré (Hartert, 1898) and specimens have been taken in the Shiré Highlands (Alexander, in British Museum) and on Lake Shirwa (Shelley, 1896).

Rhodesia
Congo
British Central Africa

In Mozambique it seems to be rather uncommon. It occurs occasionally at Beira (W. L. Sclater, 1912a) and has been taken at Inhambane in December (Francis, *fide* Stark and Sclater, 1906).

Mozambique

It is said by Nicolls and Eglington (1892) and by B. Horsbrugh (1912) to be common in the Transvaal in general, and by W. L. Sclater (1912a) at Wakkerstroom specifically. According to Stark and Sclater (1906) it has been taken at Marico by Barrett and near Potchefstroom by Ayres.

Transvaal

B. Horsbrugh (1912) states that he found it quite common in the Orange River Colony, and S. R. Clarke (1904) has recorded a few specimens from Bloemfontein. The British Museum has examples taken in May on the Rhenoster River, and Murray (*fide* Stark and Sclater, 1906) found the species near Mafeteng in Basutoland.

Orange River Colony

In Natal, T. Ayres (1871) met with it near Durban in November, and Butler, Feilden and Reid (1882) found it breeding near Newcastle from September to November. It has also been taken near Howick (Burges, in Stark and Sclater, 1906).

Natal

In Cape Colony it is not a common bird, occurring chiefly from September to December, and probably breeding (Stark and Sclater, 1906). Layard (1875–84) has reported it breeding on the Berg River in September, and occurring at Zoetendals Vlei in Bredasdorp in November. The South African Museum has specimens taken in the Cape Division in September and at Knysna in November. It has been found on the Kleinmont River in Bathurst and rarely at Port Elizabeth (Atherstone, Brown, *fide* Stark and Sclater, 1906). Bryden (1893) has recorded it from Woodhouse Kraal in Mafeking Division and Sharpe (1904) states that it is very rare at Deelfontein. C. G. Davies (1908) speaks of it as not common in East Griqualand.

Cape Colony

Along the western coast of Africa it is probably everywhere a rare bird. Andersson (1872) found it so in Damaraland, excepting near Barmen, Ondonga, where the species was common and breeding in February. Nicolls and Eglington (1892) found it common in Bechuanaland on Lake Ngami and Bryden (1893) found it on the Botletle River. From Angola specimens taken by Anchièta in Mossamedes, on the Rio Coroca and at Humbe, have been recorded (Barboza de Bocage, 1877–81).

Damaraland
Bechuana Protectorate
Angola

The type of this species is a specimen taken by Prince zu Wied (1832) at the Lagoa do Braco, Villa Belmonte, southern Brazil. Since that time no other specimens have been taken or seen in eastern South America. On the west, however, this Pochard has been taken in Peru, as far south as the Chilean border, at Arica and Mollendo in October (J. R. H. MacFarlane, 1887). According to Professor Nation (see P. L. Sclater, 1878a) it is rare at Lima, but common on some of the coastal lakes. More recently Chubb (1919) has recorded specimens from Eten, taken in October.

South America
Brazil
Peru

Lönnberg and Rendahl (1922) have reported two males taken at La Carolina, Ecuador, the first recorded from that country. F. M. Chapman (1917) had already reported it from Cali, in the Cauca Valley, northwestern Colombia, where it was common in January, February, and May, and our knowledge of its distribution in this hemisphere has been further increased by the fact that in May, 1920, some members of the Field Museum of Chicago found the species fairly common and probably nesting near Lagunillas, in the Maracaibo district, northwestern Venezuela (W. H. Osgood, *in litt.*).

Ecuador
Colombia
Venezuela

GENERAL HABITS

I HAVE already given my reasons for uniting *Nyroca nationi* and *Nyroca erythrophthalma* of South America, and *Nyroca brunnea* of Africa, under one species, which as now considered has a curious range somewhat analogous to that found in the case of the White-faced and the Fulvous Tree Ducks.

This is a typical diving duck related both to the Pochards and to the Scaups, and probably more or less intermediate between these two groups. It has affinities also with the White-eye, but in the field, as I saw it, it gives the impression of being a surface-feeder and not a diving duck at all. It has a long rakish body and it rises lightly from the water with the ease of a Mallard. It lacks entirely, the compact, chunky look of a Scaup in flight and it leaves the surface without splashing even on calm water.

Not much is known of its more intimate life-history in spite of the fact that a good deal has been written of its distribution and its appearance in various stages of plumage. It is a fresh-water duck and in Africa does not seem to occur on the shadier rivers or streams but always on open water, though not necessarily on especially deep waters for it is partial to marshes as well. It is found also about the mouths of the larger rivers. In Venezuela, Dr. W. H. Osgood writes me that he found these ducks in a lake at Lagunillas which was really a large, open swamp at tide-level, full of floating vegetation and surrounded by mangroves. This place was swarming with water birds of many kinds, ducks, rails, coots, jaçanas, screamers and herons.

WARINESS. The Southern Pochard is usually considered a wild and wary species, at least in comparison with other tropical or southern-hemisphere ducks. This is the case when the birds are in flocks, but when in pairs they act, of course, in a different manner. One writer thought that they were not quite so shy as the Maccoa Duck, meaning probably secretiveness rather than wildness (Bryden, 1893; Reichenow, 1900; Sharp, 1904; Stark and Sclater, 1906; W. L. Sclater, 1912). Neumann (1898) speaks of their never leaving the surface of the water by flight, but only by diving, when approached. Perhaps these were moulting birds. I know that in the Crater Lakes of Uganda, some of which had perhaps never been shot, I found them exceptionally alert and extremely hard to approach in a native dug-out canoe. They always jumped long before the Yellow-bills (*Anas undulata*) or Hottentot Teal. Even when flushed down-wind they would not come up-wind past the canoe as most diving ducks will, but sheered away out of shot in no time. It took a lot of long-distance shooting to collect the specimens I wanted. All the other ducks except the Whitebacks were extremely tame.

DIVING. They obtain most of their food by diving at moderate depths, although

they do sometimes "tip up" in shallow places. Sometimes I saw them quietly dive among lily-pads in order to escape observation, but usually they flew long before I got near them.

Flight. The flight is often spoken of as "very rapid," but B. Horsbrugh (1912) does not think them especially fast and speaks of their having the usual "squattering" flight along the surface before they get started, just like any diving duck when the weather is calm. Their appearance on the wing, at least that of the old males, is very striking for they look jet black and the white speculum-patch is most prominent (C. G. Davies, 1908). I have already remarked that to me they seemed very light and active on the wing and the long necks and slender bodies give them anything but a clumsy look. I could scarcely believe that they were diving ducks when I first saw them.

This bird does not seem to go about in large flocks anywhere, but singles, pairs, and small flocks of six to twelve are often mentioned in field notes. Occasionally flocks of hundreds are noticed as assembling in one place (East African lakes) but such gatherings are certainly not the rule in most parts of its range. In the Crater Lakes of Ankole and Kigezi in Uganda they were in little packs of three or four to a dozen and once I saw a really large flock of thirty or forty.

Association with other Species. There cannot be said to be much real association between this and other ducks. Neave (1910) speaks of shooting one out of a flock of African Yellow-bills but Dr. Osgood writes me that the single birds which he saw very commonly at Maracaibo, Venezuela, were alone (the females probably nesting) and did not associate with the Masked or Tree Ducks that were plentiful there. Professor Nation, who first described the duck from western South America, found it on fresh-water lakes near Lima in company with the Bahama Duck and the Cinnamon Teal. Neumann (1898) spoke of their living among rushes in what is now Kilimandjaro Province, along with the curious little Maccoa Duck (*Oxyura maccoa*). In the Natron Lakes, where it is plentiful, it was in company with African Shovellers, the African Red-bill, Grebes and Coots (Sjöstedt, 1910). I saw it on lakes in Uganda which were swarming with Yellow-bills, Hottentot Teal, White-backed Ducks and other species of ducks in smaller numbers. There were also enormous numbers of African Little Grebe and the African Great Crested Grebe. Their preference among the ducks was undoubtedly for the Yellow-bills with which they were often closely mixed, and they had nothing to do with the White-backs (*Thalassornis*).

Voice. I have found only one reference to the voice and this a very vague one without distinction as to sex. They were said to utter a somewhat twanging, rather

soft *prr-ah-ah, brr-ah-ah* (Sjöstedt, 1910). I am afraid I cannot add anything as I did not hear them calling.

The trachea is considerably dilated in its middle part, much like that of the Red-crested Pochard, Scaup, White-eye, Golden-eye and Red-breasted Merganser, but the swelling is not as great as in the Red-crested Pochard, though greater than that in the Scaup. The tracheal box is left-sided, the posterior side being almost entirely osseous, while the anterior side is composed of membranous windows supported on bony frames (P. L. Sclater, 1878a). The osseous part is a very hard bony bulb, while the keeled structure has one large membranous window in the middle and a smaller one on each side of it. The large membrane does not seem always to be intact and there is some variation in the structure of the fine bony framework in different individuals. The interior of the membranous chamber connects through a narrow passage with the bulbous portion and also freely with the left bronchus.

Food. The food has never been carefully studied. The stomach of one in Africa was filled with black laval gravel mixed with what seemed to be *Chara* algæ; another had "water plants" mixed with gravel. Those I shot in Uganda in April seemed to be feeding entirely on vegetable food, mostly small blackish seeds about two millimeters in diameter.

Courtship and Nesting. The courtship seems never to have been observed. All we know is that the nesting season is very irregular and so few nests have been found that adequate descriptions of the site chosen are as good as absent. In East Africa full-grown young were found by Schillings (1905) in July, while in Natal young ten days old were seen on September 18, others in October and November (E. A. Butler, Feilden and Reid, 1882). Eggs were taken in southwestern Africa February 23 (British Museum), while in Cape Colony, Davies (B. Horsbrugh, 1912) found a nest on the 24th of April. Along the Berg River it was "breeding" in September (Layard, 1875–84). When Dr. Osgood was at Maracaibo, Venezuela, in May, 1920, at a big swamp near sea-level these ducks were evidently nesting, for only single male birds and no females were seen. I know nothing more about the season of nesting in South America. Without a doubt it is just as irregular as in Africa.

The nest which Davies found was in a clump of grass about twenty yards from the water, a long distance for a diving duck. It was "neatly made of grass and a little down" and contained nine eggs.

The clutch numbers from five to nine and the eggs are smooth in texture, moderately glossy, and pale brown to pale cream color. They measure 2 to 2.3 inches (51 to 59 mm.) in length and 1.58 to 1.68 inches (40 to 42.5 mm.) in width (E. W. Oates, 1902; B. Horsbrugh, 1912).

Food Value. The flesh is not considered good, at least, in South Africa. "It is a poor fowl to eat, tasting strongly of mud; but as my office staff apparently thought them good, I usually shot these birds when possible," writes Horsbrugh. The same writer says that when they are driven over the guns at the end of one of the big artificial lakes in South Africa some fine sporting shots were obtained. I tasted a good few shot on Lake Chahafi and Lake Muanda in southwestern Uganda and I think they were just about as good as the Yellow-billed Ducks from the same waters.

Behavior in Captivity. The Southern Pochard was brought to England at an early date. A single female was purchased by the London Gardens from the Knowsley Collection in 1851 and lived many years there. Bolle (1856) mentions it in the Gardens during his visit in 1856. I know of no others ever imported.

Hybrids. No hybrids between this and other ducks have ever come to my notice.

TUFTED DUCK

NYROCA FULIGULA (LINNÉ)

(Plates 62, 63)

SYNONYMY

Anas fuligula Linné, Systema Naturæ, ed. 10, vol. 1, p. 128, 1758.

Anas leucotis Hermann, Tab. Affinit. Animalium, p. 161, 1783.

Anas glaucion Bonnaterre (*nec* Linné), Encyclop. Méthodique, vol. 1, p. 149, pl. 33, fig. 3, 1791.

Anas colymbis Pallas, Zoograph. Rosso-Asiat., vol. 2, p. 266, 1811.

Anas cristata Leach (*nec* Gmelin), Syst. Cat. Mamm. and Birds British Mus., p. 39, 1816.

Nyroca fuligula Fleming, Philosophy of Zool., vol. 2, p. 260, 1822.

Aythya fuligula Boie, Oken's Isis, p. 564, 1822.

Fuligula cristata Stephens, General Zoology, vol. 12, pt. 2, p. 190, 1824.

Platypus fuligulus Brehm, Lehrbuch d. Naturges. Europ. Vögel, vol. 2, p. 833, 1824.

Aythya cristata Brehm, Oken's Isis, p. 998, 1830.

Fulix fuligula Lovén, Oefvers. Kongl. Vet.-Akad. Förh., Stockholm, p. 315, 1864.

Fuligula vulgaris Hodgson, Gray's Zool. Miscellany, p. 86, no. 373, 1844.

Fuligula fuligula Lichtenstein, Nomenclator Avium, p. 102, 1854.

Fuligula patagiata Brehm, Vogelfang, p. 381, 1855.

Nyroca latirostris Bonaparte, Comptes Rend. Acad. Sci. Paris, vol. 43, p. 657, 1856.

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VERNACULAR NAMES

English: Tufted Duck, Tufted Pochard, Crested Duck, Tufted Diver, Crested Diver, Black and White Diver, Magpie Diver, Black Duck, Tufted Scaup, Black Pochard, Black Widgeon, Least Widgeon, Black Poker, Tufted Widgeon, Old Hardweather, Black and White Curre, Blue-billed Curre, Pied Duker, Lapmark Duck, Golden-eye, Indian Golden-eye, Brass-eyed Pocher, White-sided Diver.

German: Reiherente, Reigerente, Haubenente, Zopfente, Schopfente, Straussente, Straussmoor, Schupsente, Kuppenente, Schwarze Ente, Russige Ente, Moorente, Schliefente, Schwarzkopf, Fresake, Kiebitzente, Schwarztüchel, Schnelltaucher.

DOWNY YOUNG

WHITE-EYED DUCK
LESSER SCAUP DUCK

TUFTED DUCK
SCAUP DUCK

French: Morillon, Morillon huppé, Morillard, Têtard, Pilet huppé, Jacobin, Pilet baron, Pilet noir, Diablotin, Gibier rond, Pilet de marais, Noiret, Noirette, Double cercelle, Bec-bleu, Cercelle capée, Jaffre, Jaffre noir, Jaffre huppé, Morette, Boni negre.

Italian: Moretta, Moretta turca, Anatra marina, Anadin, Anada col zuffo, Pescareula, Turcheta, Caplon, Scapla, Paget, Garavela, Varnola, Penacin, Capelozo, Caponero, Zingarotta, Anitra tupputa, Scavuzza, Niedduzzu, Campanato.

Spanish: Pelucon, Coqúinero, Morell capellut, Anach de cresta, Canade moñinegro.

Portuguese: Negrinha, Negrella, Negro, Pego do mar.

Flemish: Kipping.

Dutch: Kuifeend, Kamduiker, Toppertje, Rouwbandje.

Friesian: Jolling.

Danish: Troldand, Vibeand, Topand.

Dalmatian: Crninka.

Montenegrin: Crnka-ribolooka.

Arabic: Suracah.

Croatian: Patka čapljarka, Patka krunata.

Maltese: Braimla tat-toppu.

Swedish: Vigg, Viggand, Tofsand, Marvigge, Hägerand.

Norwegian: Topand, Troldand, Lap-and.

Gaelic: Lach an Saumain, Squmalach.

Icelandic: Toppönd, Dukönd, Hegraönd.

Finnish: Jouhisotka, Pieni sortti, Vartti, Narsku, Meritelkkä, Värrä, Vikiö, Vesitetri, Narski.

Lapp: Vuokta fietta.

Russian: Chernett (Cossack), Chernedi retchnuaya, Chernuya, Coclatuya, Coclatich, Hohlushka gobubaya.

Polish: Kaczka czernica.

Czech: Kachna chocalatá.

Hungarian: Búbos récza.

Bosnian: Krunata, Crna norva.

Tartar: Dongus-giri.

Bashkir: Karasa-urdek, Alasabar, Kash-chalak.

Mangun: Ande.

Tunguse: Zachür, Jombanga, Momjag.

Ostiak: Tun-wasse.

Korean: Ain gahal.

Kuriles: Jaitshir.

Kamchatkan: Kaashin.

Zirian: Sed-utka.

Giljak: Holmr.

India, Northwest Provinces: Dubaru, Ablac.

Nepalese: Malac.

Sindi: Turando.

Telegu: Nella chilluwa.

Tamil: Nir-bathu.

Canarese: Nir-koli.

Kabul: Sonah, Ablak.

Japanese: Kinkurohajiro.

DESCRIPTION

Adult Male: Head and neck black with a long pendent occipital crest. The sides of the head have a purplish gloss. There may or may not be a white chin-spot. Mantle black; scapulars greenish to brownish black sprinkled with very fine almost obsolete vermiculations. Back, rump, upper tail-coverts and tail black. Breast black like the mantle, sharply defined from the pure white of the abdomen. Under tail-coverts black. Wing-coverts dark brown, speculum on the secondaries white, with a black posterior band formed by the tips of these feathers. Primaries dark brown on the outer web and at the tips; inner ones nearly pearl color to white, forming a white wing-patch. Tertials black with a greenish luster. Under wing-coverts white, except the marginal ones which are brown.

Iris yellow to golden yellow. Bill pale blue; nail black. Legs and feet lead-blue with the joints and webs black.

Wing 199–210 mm.; bill 38–40.5; tarsus 32–37.

Weight 1 pound, 10 ounces to 1 pound, 14 ounces (0.73 to 0.85 kilograms) (Harting, 1901); according to Millais it may reach 2 pounds (0.90 kilograms) and Hume puts 2 pounds, $\frac{1}{2}$ ounce as the maximum.

Adult Female: Somewhat like the female of the Lesser Scaup but darker on the upper side. Crest much smaller than in the male. There may or may not be a whitish patch at the base of the culmen, but not so well defined as in the Scaups. Old females become nearly black on the head and neck. On the breeding grounds the female becomes somewhat darker all over. The white of the abdomen is then much reduced and mottled with brown. The whole lower abdomen may even become dark brown, but this dark phase is not seen in every breeding bird. Millais first called attention to it.

Iris yellow. Bill slate gray. Legs gray.

Wing 188–203 mm.; bill 36–41; tarsus 32–35.

Weight 1 pound, 5 ounces to 1 pound, 12 ounces (0.59 to 0.79 kilograms).

Female in First (Juvenal) Plumage: Very much like the adult female but not so dark or rich in color; whitish face-spot absent; tail-feathers blunt at tips. Iris brownish yellow.

Male in First (Juvenal) Plumage: Like the adult female but can be distinguished by the fine vermiculations on the mantle and scapulars. The head is darker than in the young female and a distinct white face-patch may often be seen, soon, however, obscured by the incursion of black feathers. Young birds have the iris pale yellow.

Immature Male: The head becomes gradually darker during autumn, but the changes to adult plumage are slow in other regions of the body. In late November or December black feathers begin to come in on the upper mantle or breast and purplish feathers are scattered through the face and sides of neck. The flanks are still more or less gray and the crest is extremely short. By April or May the plumage is nearly complete but lacks the richness of maturity. The black breast-feathers are often margined with white, the head lacks the full iridescence, and the crest remains short.

Young in Down: This is easily distinguished from the young of the Scaups by its much blacker and sootier appearance, especially on the sides of the head, throat, upper breast and lower abdomen. The top of the head and the whole upper surface are uniform dull black, and there is no indication of light-colored wing-, scapular- or rump-patches. This is the blackest downy young of any of the diving ducks that I have seen. In life the legs and bill are dark olivaceous green while the iris is brown or brownish gray, becoming gradually (according to W. Percy) dull yellow at six weeks.

NEW ZEALAND SCAUP

Male Female

TUFTED DUCK

Male Female

MALE IN ECLIPSE: "Head and neck are all round brown-black, feathers of chin, throat and fore-neck with brownish white bases more or less exposed; black crest usually shed or much worn; mantle and scapulars as in winter but duller black and with less green gloss, feathers of whole mantle dusted with tiny white specks; remaining upper parts as in winter; upper breast brown-black, feathers narrowly (those bordering lower breast broadly) fringed white; sides of body and flanks pale drab, some feathers vermiculated greyish white and intermixed with white feathers vermiculated drab; lower belly and vent white, feathers more or less vermiculated dusky and intermixed with drab feathers more or less vermiculated whitish; under tail-coverts brown-black, some white vermiculated dusky; tail and wings as in winter" (Witherby *et al.*, 1919–22).

DISTRIBUTION

THE Tufted Duck is one of the commonest palæarctic species, its range extending in the Old World from the Atlantic to the Pacific. It appears to be a rather local duck in its distribution, especially in the breeding season, when it is abundant in certain localities and almost absent from others near by. At the same time it seems to have isolated breeding areas quite apart from the regular range. **General**

BREEDING RANGE

THIS species has recently been found nesting in Iceland (*fide* Hartert, 1920a) and there are a number of records of its occurrence there in summer, which have been catalogued by Hantzsch (1905). It probably does not nest regularly on the Faroes, though it is said to have done so in 1872 (Collin, *fide* Dresser, 1871–81). Considerable numbers are occasionally seen on the Shetlands in summer, but these are presumably non-breeding birds, as no nests have yet been found (A. H. Evans and Buckley, 1899). **Europe** **Iceland** **Faroes** **Shetlands**

In the British Isles a great transformation has taken place in the status of this duck as a breeding species. Up to the year 1900 it could not be considered as anything but a local nester, while at the present it is both common and widely distributed, nesting in practically all counties of Scotland, England and Ireland, from the Orkneys and Hebrides south (Seebohm, 1885; H. Saunders, 1899; Ussher and Warren, 1900; Millais, 1913; Witherby *et al.*, 1919–22; Savage, 1922; *et mult. al.*). **British Isles**

On the Continent a limited number breed in Norway, especially in the north (Collett, 1873; Schaanning, 1913) and the same is true of Sweden (Nilsson, 1858). In Finland, on the other hand, it is an abundant breeder, more so in the north, as well as in Lapland. Small numbers nest about Borga, Helsingfors and Abo, as well as at Uleaborg (Dresser, 1871–81; Palmgren, 1913) while on Kallavesi Lake, central Finland, it is fairly common (Suomalainen, 1908). In northern Finland and in Lapland it is everywhere abundant, as far north as Enare and to 69° north latitude (Wallengren, 1854; Palmén, 1876; S. A. Davies, 1905; Finnilä, 1913, 1914; Montell, 1917; etc.). **Norway** **Sweden** **Finland**

According to "G. L." (1918), writing in the London Field, a few Tufted Ducks nest in Denmark, but the only definite record I can find is one for 1834 (Dresser, 1871–81). But it does nest in Holstein (Naumann, 1896–1905), as well as in Mecklenburg (Wüstnei, 1902), Brunswick, Pomerania (Naumann, 1896–1905), Brandenburg (Schalow, 1915), Danzig (Ibarth, 1915), East Prussia (Geyr von Schweppenburg, 1913; Tischler, 1914), Lusatia (Hantzsch, 1903) and Saxony (Naumann, 1896–1905). There are no records of its nesting in southern Germany, and only a few doubtful ones for Liman, Switzerland (Fatio, 1904), though it nests commonly in Holland at Nadermeer Lake. There are no records of breeding in Belgium, and the record for St. Omer (Norguet, *fide* Paris, 1907) is the only one given for France, though Rogeron (1903) says he has seen specimens in summer near Angers **Denmark** **Germany** **Switzerland** **France**

and von Müller (1856) speaks of it as rare in the breeding season in the Camargue and Provence. It has been said to nest in Sicily, Sardinia, Tuscany, Lombardy, and Venice, but serious ornithologists like Giglioli (1886) and Arrigoni degli Oddi (1904), justly regard such statements as unsatisfactory.

Italy

In Montenegro it very probably breeds (Reiser and von Führer, 1896), as it does in Bosnia (Reiser, *fide* Millais, 1913), Albania and Epirus (Powys, 1860). A flock has been seen on Lake Ferto, Hungary, in June (Aquila, vol. 15, p. 327, 1908) and Reiser (1894) saw specimens in the same month in Bulgaria. According to Dombrowski (Millais, 1913) the species nests in the Dobrudja and Hartert (1920a) says it has recently done so in Rumania; but there are no records of breeding in southern Russia. Buturlin (in Dresser, 1908–09) states that some breed in Kief and Voronesh. In central Russia it nests in Tula and Moscow (Menzbier, 1881; Lorenz, 1892) and fairly commonly in Novgorod and Petrograd (Bianchi, 1907, 1910). None apparently breed in Poland, but it is said to nest in all the Baltic States (Sawitzky, 1899; Loudon, 1909). In northern Russia it is undoubtedly an abundant breeding bird, especially in the northwest, about Archangel (Seebohm, 1882a) and even in Russian Lapland (Pleske, 1886). Farther east Seebohm (1885) did not find it very common on the Petchora and did not meet with it north of latitude 67° 30′, though Trevor-Battye (1895) saw a specimen on Kolguev on August 11. It is probably a common nester in the Urals, at least in Perm (Sabanäeff, 1878) and Kasan (Russki, 1893) and down the Volga at least to Sarepta (Moeschler, 1853) and probably to Astrakhan (Seebohm, 1882). According to Radde (1884) it breeds even so far south as Lake Gotchai in the Caucasus. This is perhaps an isolated nesting locality.

Balkans

Russia

Baltic States

There is some evidence of a breeding area in the Abyssinian highlands. Blanford (1870) saw specimens there in May and others have been taken on Lakes Cialalaka, Haddo, and Hora in May and June (Salvadori, 1884, 1888), but these may have been simply non-breeders.

Africa

Abyssinia

In Asia the Tufted Duck has been taken as late as July in Palestine (Meinertzhagen, 1920) and a few are known to nest in Cyprus (Bucknill, 1911). In Persia it is possible that a restricted number stay about Seistan to nest (Zarudny, 1911), but apparently none do so in Transcaspia, or in Turkestan. Farther north, however, it breeds all over the Kirgiz steppes (Nazarow, 1887; Suschkin, 1914) and throughout western Siberia. There are few actual records of nests found in this region but Finsch (1879) found the species in the Ob basin north to Obdorsk; Poliakov (1916) says it is a fairly common breeder on the Irtysh and Ushakov (1913) speaks of it as a very common breeder about Tobolsk; Zalesski (1915) reports it from Tomsk in April; Schalow (1908) says it breeds in the northwestern Tian-shan, and Severtzoff (1883) has reported specimens from the Kara-kul, Pamir, in July. Suschkin (1913) speaks of the Saissan-nor and Russian Altai as nesting areas.

Asia

Cyprus

Persia

West Siberia

Pamir

Farther east, specimens have been taken at Akmolinsk in July (Bianchi, 1902a) and it has been reported as common on the Jenesei from Jeneseisk northward to Dudinka, 69° 30′ north latitude (Seebohm, 1880; Popham, 1898, 1901). Maak (1859) found this duck breeding on the Wiljui, and both von Bunge and von Toll (1887) and Buturlin (1908) speak of it as a common bird on the Lena and in the Werchojansk region from the latitude of Yakutsk north to 69° or 70° north latitude. Farther south it nests on the Argun River, Dauria (Taczanowski, 1873), and is very common on the Amur, especially on the lower parts (von Schrenck, 1859). According to Dörries (1888) it is common on the Suiffun and Ussuri Rivers, too, and Prjevalski (1878) states that a few nest about Lake Hanka. Northward on the coast, A. T. von Middendorff (1853) found it not uncommon in the Stanowoi Mountains and J. A. Allen (1905) has recorded a specimen from as far north as Gichiga (May 23). Nothing definite is known as to its status in Kamchatka but Mr. Kuroda writes me that specimens have been taken there (July, 1918). Limited numbers presumably nest on the Commander Islands, where specimens have been taken in May and June (Stejneger, 1887; Hartert,

East Siberia

MAP 87. Distribution of Tufted Duck (*Nyroca fuligula*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

1920). It has also been recorded from the Kuriles (Hatta and Murata, 1905–06) and examples have been taken on Saghalin on May 10, at Chaivo (Hesse, 1915) and on May 12, at Sakachama (Thayer and Bangs, 1916). On May 9, 1912, a single example was taken on St. Paul Island in the Pribilov group (Evermann, 1913), and in the Loo-choo Islands specimens have been taken as late as June 13 on Ishigaki (Owston, 1899).

Saghalin
Pribilovs
Loo-choo Islands

Winter Range

In western Europe the Tufted Duck winters in small numbers as far north as the Shetlands (A. H. Evans and Buckley, 1899). During the cold season it is generally distributed in the British Isles (Seebohm, 1885; R. Gray, 1871; Witherby *et al.*, 1919–22; H. Saunders, 1899; Ussher and Warren, 1900; etc. etc.). It is also found about the southern coasts of Norway (Schaanning, 1913) and Sweden (Wallengren, 1854), as well as on the coast of Kurland, or Latvia (Loudon, 1909). On the coasts and in many places in the interior of Germany it is a fairly common winter bird (Naumann, 1896–1905; R. Blasius, 1896; Le Roi, 1906–07; etc.) and the same is true of Denmark (Kjärbölling, 1850; "G. L.," 1918), Holland (Schlegel, 1859), Belgium (Dubois, 1886) and northwestern France (Ternier and Masse, 1907; d'Aubusson, 1911). In Portugal it is one of the commonest ducks (Tait, 1896; de Seabra, 1910) and in Spain it is common in various localities, especially on the eastern coast (Irby, 1883; A. Chapman, 1888; A. Chapman and Buck, 1910; Arévalo y Baca, 1887). Munn (1921, 1924) has recorded it from Majorca and Minorca. It is abundant on Corsica (Wharton, 1876; J. Whitehead, 1885) and is described as the commonest duck in Sardinia (Salvadori, 1865; Brooke, 1873). On the southern coast of France it is fairly common in winter (von Müller, 1856; J. H. Gurney, 1901; Griscom, 1921) and it is found throughout Italy in suitable localities (Giglioli, 1886; Arrigoni degli Oddi, 1904) though it appears to be quite rare in Malta (C. A. Wright, 1864; A. L. Adams, 1870; Despott, 1917).

Europe
Shetlands
British Isles
Scandinavia
Baltic States
Germany
Denmark
Holland
Belgium
France
Portugal
Spain
Corsica
Sardinia
Italy

In Switzerland it is a comparatively common winter bird (Fatio, 1904). Others winter in Bohemia (Fritsch, 1872), Austria (Mojsisovics von Mojsvár, 1897), Hungary (Aquila, vol. 3, p. 83, 1896; vol. 4, p. 76, 1897), Dalmatia (Kolombatovič, 1903), Montenegro (Reiser and von Führer, 1896), Albania (Powys, 1860), Greece (Lindermayer, 1860; Reiser, 1905), including Macedonia (Sladen, 1918; Chasen, 1921), and in Bulgaria, where it has been spoken of as the commonest duck (Radakoff, 1879; Alléon, 1886). Furthermore the winter range includes the whole southern littoral of Russia. Valkh (1911) speaks of the species as common on the lower Dnieper in winter and Kennedy (1921) found it abundant on the south coast of Crimea, and more common than any other species at Novorossisk on the Kuban coast.

Switzerland
Succession States
Greece
Russia

In western Africa the Tufted Duck has once been taken as far south as the Sulyma River, Sierra Leone (Büttikofer, 1892). Hartert (1920a) says it has occurred in Madeira, but gives no authority. In Morocco it is very common in some years (Drake, 1867; Favier, *fide* Irby, 1875; Hartert and Jourdain, 1923) and in parts of Algeria, as for example, Lake Fetzara, and in the northwest it is also common (Rothschild and Hartert, 1912; Millais, 1913); while in the northern Sahara, Tristram (1860) found immense numbers. Talamon (1904) and J. I. S. Whitaker (1905) describe it as not uncommon in Tunis, and Salvin (1859) found it abundant on Lake Biserta in March. Millet-Horsin (1912), however, considers it very rare at Tunis and Biserta.

Africa
Sierra Leone
Madeira
Morocco
Algeria
Tunis

In Lower Egypt it is an abundant species in winter (Shelley, 1872; Nicoll, 1919), extending south through Nubia (von Heuglin, 1873) to Khartum (W. L. Sclater and Macworth-Praed, 1920) and in small numbers to the White Nile. More to the eastward it has been taken at Adowa (von Heuglin, 1873) and appears to be plentiful on Lake Harrar and other localities in southern Abyssinia (Salvadori, 1884; Ogilvie-Grant, 1900; Ogilvie-Grant and Reid, 1901).

Egypt
Abyssinia

The British Museum has a specimen taken at Aden, and the United States National Museum has two females shot on January 6, 1910, at Butiaba on Lake Albert Nyanza, Uganda. Recently V. G. L. van Someren (1922) has reported another specimen taken on November 21, 1913, on the Yala River swamps, northeast end of Victoria Nyanza, British East Africa. Dr. Van Someren told me of one shot on Lake Naivasha, Kenya, February 8, 1924. On April 6 of the same year I saw an adult male on Lake Chahafi in extreme southwest Uganda. I chased this bird for a long time in a dug-out canoe, finally got a long shot, crippled and lost him. Hartert (1920a) states that the Tring Museum has a specimen from as far south as the Seychelles.

Uganda
Kenya
Seychelles

Turning to Asia we find that the Tufted Duck winters in Palestine in small numbers (Tristram, 1884; Meinertzhagen, 1920) and more abundantly in Cyprus (Bucknill, 1910) and in Asia Minor (Antinori, 1858; Flora Russell, 1912; Weigold, 1913). The British Museum has a specimen from Mesopotamia, where Meinertzhagen (1914) reports having seen a few. It is the commonest duck in winter in the Caucasus (Radde, 1884) and in Persia is found during the cold months abundantly on the southern Caspian (Radde, 1886) as well as about Seistan (Zarudny, 1911). In southern Afghanistan it is common (C. Swinhoe, 1882). Some even winter as far north as western Turkestan (Lansdell, 1885; Severtzoff, 1883). In Baluchistan Meinertzhagen (1920) found it a regular cold-weather visitor about Quetta. In India it is a common species, occurring in Kashmir and everywhere south of the Himalayas as far as Coimbatore (11° north latitude) and eastward throughout the valley of the Brahmaputra, as far as Lakhimpur, where it is the commonest of the diving ducks. It has also been recorded from Bhamo, and Mandalay and Arakan. In the South Shan States it is not common (Hume and Marshall, 1879; Baker, 1921; Rippon, 1901; Blanford, 1898; etc.).

Asia
Palestine
Asia Minor
Persia
Afghanistan
Turkestan
Baluchistan
India
Burma

In China it is a common species, especially in the south. H. R. Davies (1909) found it so in Yunnan, and Thayer and Bangs (1912) as well as La Touche (1922) have recorded it from the provinces of Szechwan and Hupeh, in the interior. Berezowski and Bianchi (1891) report its occurrence in Kan-su in February. On the coast this duck has been found common at Amoy and Hong-kong (R. Swinhoe, 1860), at Foochow (La Touche, 1892) and at Ningpo (R. Swinhoe, 1873), but on the lower Yangtse it is found only sparingly (Styan, 1891; Wade, 1895). Some winter as far north as Korea (Taczanowski, 1888a; C. W. Campbell, 1892), while in Japan it is found generally distributed (Blakiston and Pryer, 1878; Seebohm, 1890; Kuroda, *in litt.*). Specimens have been taken on the Loo-choo Islands (Owston, 1899; Ogawa, 1905) and in Formosa (R. Swinhoe, 1863). R. C. McGregor (1909) considers it a regular winter visitor to Luzon and other of the northern islands in the Philippine group, and there are records of its occurrence on the Pelew Islands (Hartlaub and Finsch, 1868), Borneo (Everett, 1890; Moulton, 1914), Celebes (Meyer and Wiglesworth, 1898), Guam (Seale, 1901) and the Mariannes (Lesson, Traité d'Ornith., p. 632, 1831).

China
Japan
East Indies

Migration

I know of nothing particularly noteworthy about the migration of this species. In this, as with its distribution, it much resembles the Scaup, though it is confined to fresh waters, is less hardy and more likely to seek southern regions in winter. In general these ducks leave their far-southern wintering grounds in February or March, passing over central Europe or Asia during the latter month and reaching the breeding grounds in April or May. The breeding grounds are usually deserted by October, the typical migration month in autumn. November usually finds them settled for the winter.

The return of six birds out of a total of 65 banded in the British Isles indicates a local sedentary stock. But it is worth while to notice that one (No. B. B. 67,535) marked as a young bird in Northumberland was recovered during its third summer in northern Finland, suggesting a journey to new

breeding quarters. Similar cases have been found in British-bred Mallards, Teal and Sheld-duck (Thomson, 1923).

An excess of males has been noted by many writers in this and other diving ducks. It is apparent on the breeding grounds, but more so during migration and in winter. The reason for this is hard to understand.

GENERAL HABITS

In a general way this little duck and the White-eyed Duck fill the same niche in the Old World that our Lesser Scaup does in America. It is not closely related to the true Pochards (*Nyroca ferina*, *Nyroca americana* and *Nyroca valisineria*) and comes closer to the Scaups and the White-eyed Duck than to the other diving ducks. It is certainly a typical example of the Fuliguline group and is very strictly a fresh-water bird, even more so than our own Lesser Blue-bill (*Nyroca affinis*). Its habits exhibit no especial peculiarities and it is so abundant and familiar to all European sportsmen and bird lovers that a long account of its life-history is unnecessary. Millais has done it full justice in his work on the British diving ducks, while Hume and Marshall wrote at length of its winter habits in India. Its extraordinary increase as a breeding species in the British Isles within recent years (an increase which is still going on) has made it the subject of many notes in English and Scottish journals.

This duck shows a tendency to become extremely local, moving only short distances and wintering on larger sheets of fresh water wherever they remain open. Its presence on salt water, especially on the open sea, is considered only accidental, but it does resort to tidal estuaries during severe freezes or on migration.

It prefers open waters of considerable size and moderate depth and lakes with islands and reed-studded shores. In the breeding season it seeks more sheltered surroundings.

On the water the male is easy to identify by its black back, dependent tuft, and "broad snow-white sides." The female is not easy to identify as she has no distinctive markings but, as Witherby *et al.* (1919–22) remark, the sooty-brown plumage and heavy build are useful guides. Occasionally she has a narrow white line at the base of the upper mandible but nothing like the broad white mark on the face of the female Scaup. It is difficult to distinguish her from the female of the White-eye at long ranges.

Wariness. Although not a particularly wary duck, as ducks go, it is well able to look out for itself on large sheets of water, and the few I have seen (early spring in Holland) were very far from confiding. Millais says that like other ducks they recognize the "various degrees of danger to be attached to each separate cause of disturbance. Even the individual man is separated into various categories by them, for the stealthy gunner is avoided with greater care than the casual fisherman or the digging laborer." Single specimens or pairs on the breeding grounds become much

tamer and in parks and public gardens where they are regularly fed by the public as in St. James Park, London, or at the outlet of Lake Geneva they are perfectly tame and familiar. Hume noticed that in driving big lakes in India with a line of boats the "Tufteds" could be harried back and forth all day and were very loath to leave their favorite water until night, at which time they left for good. This was exactly opposite to the actions of the Gadwall, Teal and other ducks that left before the third or fourth drive but were back on their old grounds next morning.

"Tufteds" were never easy to take in the old-time decoys and like Pochard figure rarely in the lists of birds captured by that primitive art.

Daily Movements. Not differing from many other diving ducks; they are largely day-feeders and spend their daylight hours rather far out on open sheets of water. I do not know how much they feed at night, but have no doubt they can do so when hard pressed. Their local journeys seem to be performed chiefly at night, and like all ducks they are more restless and active in the morning and evening. Lord Lilford thought them less nocturnal in their feeding than Pochards and Scaups in southern Europe.

Gait, Swimming and Diving. These little ducks are awkward enough on land and are feeble walkers. Few observers have seen them feeding on shore but in the breeding and pairing season they spend more time on land resting and preening their feathers. They do not fly from land, but scramble first into the water. Finn (1915) considers them more awkward than any other of the true diving ducks, "hobbling as if lame in both feet."

They often sit low on the water, with the tail dragging or submerged, especially if alarmed or actively feeding, but at other times they float higher. Often they prefer to leave a danger spot by swimming and diving rather than by flying. I have never heard of their perching.

This is an extremely active diver, procuring most of its food on the bottom, flocks often diving almost in unison. They seem to prefer moderate depths, from two or three feet to six or eight, and as a rule the time under water is short. I think the average time of dives for all the diving ducks has been greatly exaggerated. Fifteen or twenty seconds is a fair average for many species at moderate depths and anything over thirty or forty seconds is a long dive. Fifty seconds or over is exceptional even in the case of the deep-water sea ducks. I doubt very much if these little ducks stay under more than fifteen or twenty seconds on an average when diving in two to eight feet of water. Mr. Dewar (1924) has recently had a good deal to say about this duck in his book on the diving habits of birds. The greatest depth which he recorded was only sixteen feet and the longest dive was forty seconds. Most dives took place in two to six feet of water. The wings are not ordinarily used in diving

for food, but in play antics they are often half opened under water just as we see them in the Mallard.

The young can dive when only a few hours old both in the wild and when hatched under a hen in captivity (J. Whitaker, in Millais, 1913; S. E. Brock, 1912). The first dives are short.

Flight. Tufted Ducks do not as a rule travel in large flocks, although great assemblies have been found gathered together in their winter quarters. On the wing they have a bold and striking appearance, reminding one a little of our Lesser Scaup, but are even more sharply black-and-white. They get up with some splashing, if the weather is calm, but they rise quickly, and, as Millais says, are apt to circle a sheet of water many times before leaving it.

Association with other Species. Not especially sociable with other species, it is found in various places mixed with Pochard, White-eyes, Scaup and particularly Golden-eyes, although flocks for the most part keep their identity. Several writers have noticed how gulls have in places become regularly parasitic on Tufted Ducks, swooping at them and forcing them to drop food which they have brought up from the bottom (Naumann, 1896–1905; Massingham, 1921). Coots also follow them about and "profit by their labors," picking from the surface of the water such food as is stirred up by the submerged ducks (Ingram, 1921). A nest with six Tufted's eggs and one egg of the Pochard was mentioned by Seebohm (1885).

Voice. It seems that few writers have correctly described the voice of the male, which as a matter of fact is almost indescribable in print and is heard only in the breeding time. I remember giving up as hopeless the attempt to render the sounds into words, but S. E. Brock (1912) has come near to it. He says, "At frequent intervals the beautiful note — a soft, liquid, several-syllabled utterance, rarely penetrating to any distance — is uttered, commonly in chorus by several birds together." Millais calls it a low gentle whistle something like the word *hoi* and "well-nigh impossible to express." Heinroth says he has never heard the males make any sound, which is not surprising, for one has to be very close, because the note (if such it may be called) does not carry much farther than the gentle *coo* of the male Scaup.

Females have the rough, harsh *korr, korr*, familiar in so many diving ducks. Millais states that this cry is uttered by both sexes but I do not know of any Pochards or Scaups where the male has a note at all resembling the female's.

The trachea, described by Latham and Romsey (1798), Yarrell (1884–85) and others, is typical of the diving ducks. The drum-like part resembles the same structure in the Pochard and is, in fact, scarcely to be distinguished from it. But the bony box-like portion of it "is elevated" and not otherwise to be distinguished from that

of the Scaup except by its smaller size. The windpipe is uniform in caliber throughout its length.

Food. Most of the food is obtained from the bottom at moderate depths (two to six feet) but this does not mean that a great deal may not be picked up on the surface in summer, or even caught in the air while swimming. The young probably get their first food from the surface but it is known that some of them dive when only a few hours old (S. E. Brock, 1912). I have found no very careful analyses of stomach contents, merely lists of animal and vegetable material, which do not give a very accurate picture of the proportions of the different sorts of food. The chief diet consists of aquatic animals of various kinds: fresh-water mussels and snails, insects, frogs and tadpoles. Probably a much larger proportion of animal food is taken than is the case with the better class of diving ducks (the true Pochards) but in winter there is found besides mussels and the larvæ of insects, many seeds of *Polygonum amphibium*, *P. persicaria* and *P. lapathifolium*, as well as *Rumex* and pond-weeds (A. J. Jäckel, 1891).

Those from fresh water in Ireland contained seeds of several species of plants, soft vegetable matter, insects of various kinds, among them *Notonectes* or water-boatmen, and some minute bivalve shells (*Pisidium*). In one were larger snail-shells. The salt-water feed in Belfast Bay was made up of minute mollusks of the common sorts (W. Thompson, 1851).

In the Philippines they feed on small fresh-water mollusks and the larvæ of frogs (R. C. McGregor, 1909), while fish spawn and various insects and their larvæ have been mentioned (Saxby, 1874). On Loch Leven in Scotland the food (in autumn?) consisted of mollusks: *Cyclas cornea*, *Limnæa peregra* (W. Evans, 1896).

Courtship and Nesting. Pairing with its attendant display may take place rather early in the spring, at least as early as March in western Europe, although these activities are often more or less delayed and interrupted by weather conditions. S. E. Brock (1912) found odd pairs consorting together in Scotland as early as late January, but it was late February before "sexual influences" began to show appreciable outward effect on the birds. The display itself is not particularly noteworthy and has been well described by S. E. Brock (1912), Wormald (1914) and Gerald Legge (in Millais, 1913).

My own notes give it as follows: the head is stretched up stiff and straight and as the call is given (a soft liquid whistle of several syllables) it is brought down quickly while the whole body shivers a little. This display is not at all impressive and the crest is not raised to a noticeable degree. It appears, however, that several good observers have seen the drake carry out more action than this, for besides the upward toss of the head and bill (which is also characteristic of the female) the male does at

times throw the head sharply backward so as to "touch or almost touch the dorsal feathers" resembling the posture of the Golden-eye but "less forcible and spasmodic and without the vocal accompaniment." Another action mentioned by Brock as rarer, is the raising of the fore part of the body in the water in a somewhat slow and deliberate manner as though about to flap the wings, the head and neck being simultaneously extended almost perpendicularly upward. The backward throw of the head in the drake and the "bill tossing" action of both sexes continue more or less after the pairing season.

A rather intensive and very interesting study of paired Tufteds was made by S. E. Brock through the pre-nesting period and brought out some points of special interest. At this season (April) the birds spend much time ashore dozing and at intervals nibbling and pulling at the upper breast-feathers as if some irritating factor were at work. This preening is quite different in character from that seen ordinarily in the water during autumn and winter. Another curious trait which he watched in several pairs during late April seemed to be an incipient nest building and was common to both sexes. The following quotation gives an idea of this habit:

"*23rd April*, 7.55 A.M. — Three pairs of birds sitting on grassy bank close to the water's edge, each couple a little apart. One pair at same spot as yesterday. 8.5 — Male of this pair settles in hollow used yesterday, and pulls a little at surrounding vegetation, later dozing; female of second pair plucking slightly and vaguely at grass beside her. All six birds doze intermittently, but frequently rising to preen. . . . 8.25 — Male of first pair (still in the hollow) plucks at grass, wheels round in his place and settles down again, renewing his plucking actions a little later. 8.40 — Male of third pair goes through similar antics, and now, for the first time, strands of grass are clearly visible in the bill; they are pulled up and dropped by the bird's side. Later he goes to sleep, his head nodding forward. 8.50 — Male of first pair plucks a little and goes through the action of swallowing."

Pursuit flights are seen on the breeding grounds, but these are not so obvious a feature as in the Mallard and the flights are seldom continued for any great distance.

Although pairing and arrival upon the breeding places often take place very early, the actual nesting is somewhat late. In England the usual time is late May or early June but some begin as early as May 18 (Millais). Norfolk dates are said to be rather early and Scotch dates a week or ten days later. Continental records are mostly for early June, but there is one date for April 21 at Havel River, Germany (Naumann, 1896–1905).

The actual site is generally close to the water (sometimes one hundred yards away from it) but on rather dry ground in dense vegetation or under bushes on sloping banks of islands, high tussocks, low dykes, long points of land and places that were once wet but have recently dried off. They seem never (?) to build actually over the water as the Pochards and the Ruddy Ducks do. The nest is often rather well con-

structed and has a depth of about 14 centimeters. A very unusual nesting site for a diving duck was recorded by P. D. Mallock (in Millais, 1913) on the high wall on Castle Isle, Loch Leven, at 80 to 100 feet above the water. It seems that they do not always walk to their nests!

Eggs vary from six or seven to eleven or twelve but the usual number is from eight to ten with the average around nine. Unusually large clutches, probably the result of two or more birds, are mentioned. One nest in Ireland contained fourteen (Ussher and Warren, 1900). Jourdain (in Millais) took nests that contained eleven, twelve, fifteen, sixteen and eighteen eggs and one with sixteen was mentioned by Trevelyan (1908). In fact he once saw in Derbyshire a female Tufted Duck sitting on top of a pile of no less than twenty-eight eggs, which she was quite unable to cover, and he believed that in this case about five ducks were laying in the same nest!

The eggs are pale olive green, greenish buff, and pale yellowish or buff. They are very similar to those of the Pochard, Scaup, Golden-eye and other ducks, but Mr. Wormald assured me that in his ponds he could easily tell these eggs from those of any other species of duck, which was more than he could say for most of his web-footed friends. They are slightly smaller and lighter in color than the Pochard's or Scaup's eggs. The average of 150 as given by Hartert (1920a) is 58.99 by 40.75 mm. The maximum length was 65.9 and the minimum 53; the greatest width was 47.2 and the smallest 37.7. The down is dark and compact with very obscure white centers and without white tips, while the feathers scattered through it are grayish or whitish. The down is said to be smaller and darker than that of the Pochard (Seebohm, 1885). The total clutch is found to be three-quarters of the female's weight which is a large proportion, apparently exceeded only by the White-headed Duck, Golden-eye, Smew, Garganey, Mandarin, and Carolina Ducks (Heinroth, 1922).

It is interesting to note that in a general way most of the diving ducks have larger eggs than the surface-feeders as compared to the body weight of the female (Heinroth, 1922).

The incubation period has been variously given as from twenty-three days to twenty-eight days. I think that twenty-five days will be found nearer the average time. Mr. Wormald's records showed this period, as well as Heinroth's (1908) captivity records. See also Trevelyan (1908); H. Noble (1908); W. Evans (1891).

The eggs are laid early in the day and at first the male stays in close proximity, acting as a sort of guardian and chasing away intruders. The female acts more or less in the same fashion yet instances where two females make use of the same nest are common enough. The young at first evidently secure a great deal of food off the surface of the water; yet they can dive, although a little awkwardly, when only a few hours old. The time submerged is at first short (five to eight seconds) but increases with age. They can fly at about six weeks. The males, of course, leave the females during the incubation and in late June leave the breeding quarters entirely. There

is a mystery about where they go, as with males of other species during summer moult.

STATUS. The most remarkable thing in the history of this duck is its recent extension of range in Scotland, Ireland, and England. This has been the subject of essays in British periodicals almost too numerous to mention; actual facts about the spread of the breeding stock are plain enough. Less easy, however, is it to account for the reasons of this influx or to tell where the breeders come from. No doubt more careful protection during the breeding season, the passage of the Wild Birds Protection Act in 1886 and the keeping and breeding of pairs in a semi-confined state have all contributed to its spread. But it does seem as if other factors must have come into play. A rather theoretical treatise on the possible origin of the new breeding wave was written by Harvie-Brown (1896, 1896a).

We know that the Tufted Duck bred in Scotland as early as the seventies and probably very much before that at Loch Leven (Millais, 1913). It was probably an early breeder in Norfolk (1823 *fide* H. Saunders, 1899) and it certainly nested at Osberton in Nottinghamshire since 1854 (Milner, 1854) and possibly still earlier in Yorkshire (1849, R. B. Cooke, 1850). But it could not have been anything but a scarce and local nester anywhere in England until the seventies and eighties. Now it is found almost everywhere in suitable ponds and lakes, far outnumbers the Pochard and is still increasing. This is a most interesting example of an extension of breeding range in a species which is shot regularly through the open season, but protected during its nesting.

In Ireland it was not found breeding by the early writers (W. Thompson, 1851) and no nest was actually discovered until 1877 or 1879 (Ussher and Warren, 1900). After this its spread was rapid until twenty years later it was nesting in nearly all parts.

In Germany there are no indications of a very recent increase, excepting in East Prussia where it is very abundant and probably increasing (Geyr von Schweppenburg, 1913; Tischler, 1914).

It is said to be the commonest duck in the Caucasus, especially in severe winters (Radde, 1884) and is very common on the lower Amur (von Schrenck, 1859). Its great abundance in winter in India is spoken of both by Hume and Marshall (1879) and by Baker (1921). In the Punjab, the Northwest Provinces and Oudh there are lakes where the former writers saw 10,000 at one time. Nevertheless large bags are not commonly made by Indian shooters.

Mr. N. Kuroda writes me that it is a very common winter visitor in Japan, although less so than the Scaup.

ENEMIES. The usual predaceous birds and mammals take occasional toll of these

ducks and in the British Isles large pike often devour the downy young. In Scotland foxes catch a few birds on the nests, while the Hooded Crows and occasionally gulls destroy the eggs (Millais, 1913). A list of parasites is given in Naumann (1896–1905).

Damage. Nothing recorded. It has never been noticed that they are partial to valuable kinds of shell-fish.

Food Value. General opinion places this bird as only fair eating. Its fondness for animal food prevents its ever ranking very high. Hume (in Hume and Marshall, 1879), who was particular about the birds he ate, considered them poor and says they often proved rank, "froggy," or "fishy," so that in his later years he never cooked them when anything else was procurable. Other writers rank them as fair to poor, excepting Lord Lilford (1895) who thought their flesh "far superior in flavor to that of the Common Pochard" when living on fresh water. In France so little was thought of it that a special dispensation sanctioned its use during Lent and on fast-days, although I think this somewhat arbitrary ruling applied more to the Scoters than to the Tufted Duck.

Hunt. Although like other diving ducks this bird was never easy to capture in the tunnel-nets of the decoys, it must have always been an easy subject for persecution in summer, when it becomes tame. It is shot by stalking occasionally, but not easily by sailing down upon flocks in open water. More commonly it is taken by placing guns at favorable points on a preserved piece of water. Some, but not a great number, are taken by punt-shooters in the estuaries and along the coast. It is not an easy bird to shoot on large sheets of water. I read that the French hut-shooters account for only a few of them.

When diving near shore it can be run down upon between dives and shot when it rises, just as we so often do with Golden-eye around the shores of our ponds.

In Ireland they are, or were, taken by means of wide-mesh nets spread about fifteen feet under water in Lough Neagh (Ussher and Warren, 1900): a deadly device for capturing any sort of diving duck, and one that ought to be rooted out everywhere.

Hume and Marshall (1879) give a fine picture of one of the great Indian duck drives on a long narrow lake during which a good bag of "Tufteds" was made. They say, "If they are comfortably settled on a sheet of water that suits them and where they have sojourned in peace for a month or two, it is scarcely possible to drive them away from it the first day. Next day, after they have been *thoroughly* harried not a bird is sometimes to be seen, but they will scarcely quit till after dark. In this respect they are like coots (*Fulica*) and if means and appliances are avail-

able, they may be worked just as we work these towards the close of autumn at home."

Behavior in Captivity. The Tufted Duck was perhaps one of the earliest ducks to be kept in confinement. It has shown itself very adaptable to the conditions of ornamental ponds. It appears in the list of birds kept in the menagerie of Louis XIV at Versailles (Loisel, 1912) and Willughby and Ray (1678) speak of it as being kept in St. James Park. It was apparently present in the London Gardens from the time of their foundation (P. L. Sclater, 1880). Between the years 1848 and 1868 it bred there no less than twenty-one times (P. L. Sclater, 1869), and it hybridized freely with the White-eyed Pochard producing many fertile hybrids (P. L. Sclater, 1880).

The old birds are very fond of bread soaked in water, but do perfectly well on ordinary grains, and live to a good age. In London the average age of twenty-three specimens was three years and four months, the longest being ten years and five months (P. C. Mitchell, 1911). Rogeron (1903) kept one for twelve years and Schmidt (1878) claims to have had one for sixteen years. Mr. Astley writes me that he had a hybrid between this species and the Rosy-billed Duck that died at the age of twenty-one years!

A clutch of ten eggs which Wormald (1906) placed under a wild Mallard duck hatched successfully but the duck proved a poor mother and they were given to a hen. Although the Mallard female usually covers her young for at least half a day, these ducklings started off for the pond when only three hours old. They throve well on duck-weed, dried flies and ant "eggs" floated for them on the water, and they swam and dived about for five hours on the first day. The great trouble was catching them up at night in order to get them back into the coop. Wormald noticed that the sexes were hard to distinguish before October and he doubts whether they breed until two years old (see also J. H. Verrall, in Hubbard, 1907). Mr. Wormald supplements the food in winter with chopped marigolds, turnips, potatoes and grass, as a substitute for pond-weeds. As with other wild ducks it occasionally happens that the young at first refuse all food. As a remedy Mr. Wormald suggests that they may often be induced to "pick" if food is sprinkled about the level of their bills on blades of grass, or even on the backs of their companions. His earliest captive nesting date was May 8, somewhat ahead of the usual wild records.

Before the War, Tufted Ducks would bring from 30 to 35 shillings the couple in England. Post-war prices are naturally much higher. Hand-reared stock brings about 70 shillings and wild-caught stock about 50 shillings the pair to-day.

In America the species is seldom to be had from dealers, and is rarely seen outside the larger zoölogical gardens. Mr. Henry Cooke of Woodbury, Long Island, is said to have bred it, but I know of no other instance of its having reproduced with us.

Hybrids. In the wild state the hybrid between this species and the Common Pochard is perhaps the most usual, though crosses with the White-eyed Duck have been several times recorded.

In confinement this duck has crossed with many other species, including the Scaup (Rotterdam Gardens — Büttikofer, *in litt.*), the male Golden-eye (Astley, 1921, p. 99), the Rosy-billed Duck (Astley, *in litt.*), the White-eyed Duck (very commonly), the European Widgeon (Heinroth, 1911), the Carolina Duck (Poll, 1911), and the Garganey (Naumann, 1895–1906). Hybrids between this and the White-eyed Duck breed freely *inter se* and with their parents, but I have no information regarding the fertility or sterility of the other crosses.

NEW ZEALAND SCAUP

NYROCA NOVÆ SEELANDIÆ (GMELIN)

(Plate 63)

SYNONYMY

Anas novæ seelandiæ Gmelin, Linné's Systema Naturæ, ed. 13, vol. 1, pt. 2, p. 541, 1789.

Anas novæ zealandiæ Latham, Index Ornith., vol. 2, p. 870, 1790.

Fuligula novæ zealandiæ Stephens, General Zoology, vol. 12, pt. 2, p. 210, 1824.

Anas atricilla Forster, Descriptiones Animalium, p. 95, 1844.

Marila novæ zealandiæ Bonaparte, Comptes Rend. Acad. Sci. Paris, vol. 43, p. 651, 1856.

Fulix novæ seelandiæ G. R. Gray, Hand-list, vol. 3, p. 86, 1871.

VERNACULAR NAMES

English: New Zealand Scaup, Black Widgeon, Black Teal.

Maori: Papango, Tetepango, Matapouri, Titiporangi, Raipo, He Patek.

DESCRIPTION

ADULT MALE: Head and neck black, glossed with purple when looking toward direct sunlight, and dark green when looking away from it. Chin sometimes, but not always white. Mantle black, scapulars black with more or less greenish metallic reflections, and dotted with very fine brown vermiculations, as in the Tufted Duck (*Nyroca fuligula*). Back, rump, upper tail-coverts and tail black. Breast like the mantle, black, shading off into the abdomen, which is brown and white, with a few coarsely vermiculated feathers intermixed. The lower abdomen is marked with coarse blackish transverse barring; under tail-coverts black, sides and flanks dull brown. Outer wing-coverts very dark brown with a greenish tinge. Secondaries white at their bases, forming a narrow speculum, and tipped with a broad greenish-black band. Primaries dark brown at outer margins and tips, and becoming progressively lighter inward. Tertials greenish black. Marginal under wing-coverts dark brown, rest of under wing nearly white.

Iris bright yellow. Bill bluish black to ash-blue, the tip black. Legs and feet gray with the webs black.

Wing 177–186 mm.; bill 36–40; tarsus 35–37.

ADULT FEMALE: Head and neck dark brown, almost black on the occiput. A white area on the forehead and along base of culmen, with sometimes a small white chin-spot. Mantle, scapulars, back, rump and tail very dark brown, with greenish reflections. Breast, sides and flanks richer brown, almost chestnut color in the latter region. Abdomen brown, but the feathers tipped with white, giving a dull mottled appearance. Under tail-coverts blackish brown with some vermiculated whitish feathers. Wing nearly as in the male.

Iris brown. Bill blue-black. Legs and feet as in the male (Hutton, 1870).

Wing 170–180 mm.; bill 35–38; tarsus 34.

IMMATURE FEMALE: The female at first lacks the white face-patch, and is very much lighter on the abdomen; almost white, in fact. The upper surface is the same as in the adult female.

IMMATURE MALE: Not examined.

DOWNY YOUNG: Has the down thick-set, the upper parts pale clove brown, the under parts white; a dusky collar around the neck; an obscure white spot on each wing, and a small one on each side of the rump; the hair-like filaments on the upper parts rather long, very fine in texture, and perfectly black. Iris dark brown; bill reddish brown, the under mandible yellow, with a brownish tip; feet light brown, both these and the bill having a fine polish (Buller).

DISTRIBUTION

THIS species is confined to New Zealand, where it is generally distributed, though commoner on the North than on the South Island (Buller, 1888; Hutton and Drummond, 1905), to Auckland Island (Hutton, 1870) and to the Chatham Islands (Forbes, 1893).

GENERAL HABITS

THIS duck, so imperfectly known to most sportsmen and ornithologists, is, or apparently once was, very numerous on rivers and lagoons, anywhere, in fact, where freshwater feeding grounds were available. It was according to Buller (1888) seldom found in the hill creeks or on the sea-shore. Potts (1870) says it used to be common in the hill country but as long ago as his time had quite disappeared in some districts.

It is probably as closely related to the Pochards as to the Scaups and has all the characteristics of a true diving duck.

It was in former times very tame, and seems to have always been reluctant in using its wings. Buller (1888) remarks that its powers of flight are very feeble, that it never rises high in the air and generally skims along the surface. It is an expert diver and eludes pursuit in that way.

Like other diving ducks they are very gregarious and in winter assemble in large flocks, mingling with the Australian Black Duck and other species. At other seasons they are in pairs or small parties. Travers (1872) who speaks of them as usually found in small flocks, saw them frequently sitting on half-submerged logs close to the bank, where, he thought, they were watching for fish. It is, however, very unlikely that fish is their chief food. He found them not at all shy. They would drop quietly into the water from logs, when approached.

Buller (1888) noticed that they were semi-nocturnal in their habits, and when eel-fishing parties lighted their fires on the banks of a stream, these inquisitive birds, he says, swam close up and manifested great curiosity. In his opinion they are naturally fearless and when protected become very tame.

None of the observers who have written about this species seems to have distinguished the voices of the sexes. Buller merely states that when playing on the water it has a soft sibilant note and at intervals a feeble *quack*.

Eggs have been found as late as the 17th of March or even the last week in March (Buller). The British Museum (E. W. Oates, 1902) has eggs taken on January 3 and October 18. There is probably no sharply defined nesting period, at least in the northern part of its range. Potts (1870) found their nests under huge "Maori-heads" (*Carex virgata*) or well concealed by large snow-grass tussocks, a few feet from the water where there was a rent or crack in the ground. The eggs are five to seven or even more in number, rather large in comparison with the size of the bird and of a rich dark cream color. They measure 2.5 by 1.6 inches (64 by 40.5 mm.). Although the eggs are bedded in down, as in other ducks, Travers noticed a rather interesting point of behavior in a pair of ducks whose nest he found. He took three of the eggs away and the remaining four hatched out in due course. The old birds were remarkably tame, allowing him to approach within a few yards of them, then hustling off the nest and returning to it again as soon as he had withdrawn himself. He remarked this curious fact, that during incubation, the duck was accustomed on leaving the nest to conceal the eggs with a covering of duck-weed taken dripping wet from the lake. He claims to have seen this on several occasions, and found that the eggs hatched in spite of these wet applications.

Judging by the sad reduction in the numbers of almost all the indigenous birds of New Zealand it was fair to assume that this species had shared a similar fate. But such is not the case. On the Papaitonga Lake, owing to rigid protection, it had become very numerous again by 1905 (Buller, 1905), but as early as 1870, Potts reported it as fast disappearing in the hill country. Now comes a much more reassuring bit of news from Mr. J. S. Myers (1923) who says that no fear of the diminution of this duck need be entertained. Its preference for large open sheets of water makes it difficult to get at except during the nesting season. The almost invariable choice of a nest-site on the water's edge, usually in *Phormium tenax* (flax) clumps makes it, however, more vulnerable at this time than for instance the Gray Duck (*Anas superciliosa*). Since reading this, I have talked with Mr. Myers, who tells me that the status of this duck is perfectly satisfactory.

It has never been exported alive to Europe or America and Buller says he has never heard of any attempt to "domesticate" it.

SCAUP DUCK

NYROCA MARILA (LINNÉ)

(Plates 62, 64)

SYNONYMY

Anas marila Linné, Systema Naturæ, ed. 12, vol. 1, p. 196, 1766.
Anas frenata Sparrman, Museum Carlsonianum, pl. 38, 1786.
Nyroca marila Fleming, Philosophy of Zool., vol. 2, p. 260, 1822.
Aythya marila Boie, Oken's Isis, p. 564, 1822.
Anas marina Drapiez, Dictionnaire Class. des Sci. Nat., vol. 3, p. 135, 1823 (*? errorim*).
Fuligula marila Stephens, General Zoology, vol. 12, pt. 2, p. 198, 1824.
Platypus marilus Brehm, Lehrbuch Naturges. Europ. Vögel, vol. 2, p. 830, 1824.
Aythya islandica Brehm, Oken's Isis, p. 998, 1830.
Aythya leuconotos Brehm, Oken's Isis, p. 998, 1830.
Fuligula gesneri Eyton, Cat. British Birds, p. 58, 1836.
Fuligula marina Swainson, Classification of Birds, vol. 2, p. 368, 1836.
Fuligula marilla Eyton, Monograph Anatidæ, p. 156, 1838.
Fuligula islandica Brehm, Vogelfang, p. 381, 1855.
Fuligula leuconotos Brehm, Vogelfang, p. 381, 1855.
Marila frenata Bonaparte, Comptes Rend. Acad. Sci. Paris, vol. 43, p. 651, 1856.
Fulix marila Cassin, Proc. Acad. Nat. Sci. Philadelphia, p. 322, 1862.
Additional synonymy under Geographical Races.

VERNACULAR NAMES

English: Scaup Duck, Greater Scaup, Common Scaup, Blue-bill, Big Blue-bill, Lake Blue-bill, Black-head, Big Black-head, Greater Black-head, Bay Black-head, Broad-bill, Shuffler, Black-jack, Raft Duck, Flocking Duck, Widgeon, Troop-fowl, Gray-back, Black-neck, Winter Broad-bill, Salt-water Broad-bill, Mussel Duck, Sea Duck, Green-head, Bull-neck, Black Scaup, Black Poker, Mealy-back, Bell-wigeon, Teal-drake, Covy Duck, White-eyed Duck, Bridle Duck.

German: Bergente, Bergmoorente, Bergtauchente, Moorente, Moderente, Alpenente, Muschelente, Schaufelente, Aschenente, Schimmelente, Taucherpfeifente, Perlente.

French: Milouinan, Morillon milouinan, Morillon à tête brune, Morillon à tête noire, Gros têtard à tête brune, Pilet rayé, Pilet maillard, Gros canard d'automne, Dos gris, Morette, Jaffre noir et blanc.

LESSER SCAUP DUCK

Female (Breeding)

Female (Winter)

Male (Winter)

SCAUP DUCK

Female

Male

Immature Male

Italian: Moretta grigia, Moretton, Pescareula, Magasseto, Campanaton, Moro, Stampanaton, Murett, Moretta grixa, Buscin, Moretta nera, Niedduzen.
Spanish: Buixot.
Danish: Bjergand, Polsk Aedelmand, Skjaeland.
Norwegian: Bjergand, Li-and, Berg-and, Svart-and.
Swedish: Hvitbuk, Berg-and, Grimmad-and, Is-and, Doppand.
Dutch: Topper-eend, Veldduiker.
Icelandic: Dukönd, Hrafnsönd.
Finnish: Tunturisotka, Iso sortti, Karitelkkä.
Lapp: Stuora fietag.
Esthonian: Leela kerra.
Russian: Golubaya-chernet, Beloglaska, Sorowoi nyrok, Morjanka, Cheredy.
Polish: Kaczka ogorzalka.
Czech: Kaholka.
Hungarian: Hegyi récze.
Croatian: Patka crninka, Patka rujavka.
Arabic: Jankljha.
Ostiak: Langi-chentch.
Samoyed: Tanebu.
Japanese: Nakihajiro, Suzugamo.

DESCRIPTION

Adult Male: Head and neck black, glossed on the face and sides of neck with dark green. Sometimes there is a white spot on the chin. Mantle, as well as whole breast, deep black. Scapulars white, irregularly barred with narrow wavy black lines, the black bars becoming much wider on the long scapulars. Back, rump, and upper tail-coverts black. Tail dark brown. The under side has the whole breast black like the neck, sharply defined from the white of the abdomen and flanks. Lower abdomen more or less gray and vermiculated. Under tail-coverts black, slightly mixed with gray. Outer wing-coverts dark gray-brown finely vermiculated with white, except the last row, which have greenish reflections and no vermiculations. Speculum white, bounded posteriorly by a wide black band which is carried by the tips of the secondaries. Primaries blackish on the outer web and brownish to pearl gray on the inner web. There is, however, considerable variation in the color of the inner primaries. Under wing white except the marginal coverts which are mixed with brown.

Iris light yellow to bright lemon-orange color. Bill pale grayish blue to bright lead gray. Legs and toes lead blue.

Wing 220–233 mm.; bill 43–47; tarsus 35–40.

Weight 2 pounds, 4 ounces to 2 pounds, 10 ounces (1.0 to 1.1 kilograms); exceptionally 2 pounds, 12 ounces (1.2 kilograms) Martha's Vineyard Island, Massachusetts, 1919. Average of adult birds in December at Pamlico Sound, North Carolina, is 2 pounds, $5\frac{1}{2}$ ounces.

Adult Female: Forehead and an irregular patch along the base of the culmen white, but there is a great deal of variation among individuals. Sometimes there is little or no white on forehead and chin and the patch along the base of culmen may be greatly reduced. Remainder of head brown, sometimes (probably in older specimens) very dark brown or blackish. Mantle and scapulars dark brown,

the latter often containing a few vermiculated feathers. Back, rump, upper tail-coverts and tail very dark brown. Upper breast brownish, fading into the white of the lower breast and upper abdomen. Lower abdomen and under tail-coverts more or less brownish. Outer wing-coverts uniform like the mantle. Remainder of wing nearly as in male. A very old female (Museum of Comparative Zoölogy) formerly in a collection of live water-fowl, is beginning to assume male plumage and has the head black, while the white face-patch is still present. There are black feathers coming in on the breast.

Iris yellow. Bill as in male but not so brilliant. Legs and feet as in male but duller.

Wing 202–220 mm.; bill 41–46; tarsus 40.

Weight 2 pounds to 2 pounds, 5 ounces (0.90 to 1.0 kilogram) average of adults in North Carolina in December 2 pounds, 2 ounces.

Note: This sex cannot be distinguished from the female of the Lesser Scaup except by the larger measurements of bill and wing.

Female in First (Juvenal) Plumage: Very like the adult female, but the white face-patches are much more obscure and at first are scarcely to be seen. The forehead is nearly always brown. The scapulars do not at first show any vermiculation and the lower abdomen is apt to be brown, while the tail-feathers are faded and worn at the tips. These immature females can be told at a glance from American Red-heads or European Pochards in similar plumage by their white speculum-patches. They can be distinguished from the females of the Ring-necked Scaup (*Nyroca collaris*) by the same character. They have a very close resemblance to the female of the Ferruginous Duck (*Nyroca nyroca*) but are much larger. They are extremely close to the Australian Scaup (*Nyroca australis*) in similar plumage, but have the whole bill bluish instead of blue only at the tip.

Young Male in First (Juvenal) Plumage: At first very much like the female but the scapulars show a considerable amount of vermiculation long before such feathers appear in the young female. There is a patch of white along the base of the culmen but the forehead and chin are brown. The occipital region and also the sides of the head are usually darker than in the young female.

Immature Male: By early October a few black feathers usually appear along the sides of the head, and finally the white face-patch is completely obscured. Later on a few black feathers begin to appear on the upper breast or the mantle and progression to adult stage is gradual. As in other ducks, however, changes to maturity are far from being regular and males in very immature stages may be found in November and December or even later.

Male in Eclipse: No plumage at all resembling that of the female is apparently ever assumed. Two old males which I took in Massachusetts in early August correspond exactly to the description given by Millais for males in eclipse. The head is dirty-brown to black, except for an indication of white on the area next to the culmen and with more or less grayish brown on the cheeks. There is a distinct light-colored brownish collar. The mantle is not solid black but filled with new vermiculated black-and-white feathers. The scapular region is filled with new feathers that are very much but not exactly like the old ones. Millais thinks that there is no intermediate or eclipse dress here, but a direct change from winter plumage. This I think is open to doubt. The breast is black, each feather narrowly tipped with white, and the lower breast merges into a brownish mottled area, which gives way to the white of the abdomen. The flanks are vermiculated brown and white. I do not believe that there is a direct moult from winter to winter plumage on the breast, such as Millais has described. The black breast-feathers of the eclipse plumage are not exactly like the feathers of the mature plumage and often have concealed vermiculations. The most perfect eclipse specimens are probably to be found in early September, as with the Lesser Scaup. I have reason to think that at this time there are no black feathers

on the breast, just as with the Lesser Scaup. However, I have not enough material to settle this point for males of all the diving ducks are hard to obtain in full eclipse stages.

Young in Down (Plate 62): Much darker-colored both above and below than the young of the European Pochard, the Red-head or the Canvas-back. It is also much darker on the face and upper breast than the downy young of the Ferruginous Duck, as well as being larger. It is not so easily distinguished from the young Tufted Duck (*Nyroca fuligula*) which is even blacker than the young of the present species, especially on the sides of the head and neck. General color very dark brown above and yellowish buff below, darker on the breast and lower abdomen. The top of the head is dark brown but there is some indication of a supra-orbital light area, and a post-orbital darker streak. There may also be a faint dark streak lower down on the cheeks.

A very young female, partly in down, from Nome, Alaska, August 21, has the breast and flanks gray, fading to pure white on the abdomen. The upper parts, except the scapulars, are still in down and the primaries have not yet started. Even the occiput is still downy. The throat and cheeks are brownish gray with a post-orbital white spot.

DISTRIBUTION

The range of the Scaup Duck is a very extended one, including the greater part of the northern hemisphere. It is difficult to define because the birds commonly seek out inaccessible and far northern regions for breeding and because in America the Lesser Scaup is so often confused with it. The distribution of the sexes in winter is peculiar and does not seem to depend entirely on latitude. Vast numbers of Scaup do not breed, and like the Scoters may be found almost anywhere in summer. Thus the actual breeding limits are always uncertain until a nest is discovered.

Breeding Range

In North America in summer the Scaup is found chiefly in Alaska and north-central Canada, breeding records for the United States being only sporadic or based on incomplete evidence. Off Alaska, L. M. Turner (1886), A. H. Clark (1911) and Bent (1912) found it on the Aleutians, especially on Agattu and Atka, but there is no evidence that it breeds there. Evermann (1913) has recorded a specimen taken in late April on St. Paul's Island in the Pribilov group. On the mainland Nelson (1887) found it common all over, extending from the mouth of the Yukon north to Kotzebue Sound, and Dall and Bannister (1867) also found it breeding at the mouth of the Yukon. It is common also as a breeder at Hooper Bay a little farther south (H. B. Conover, *in litt.*). F. S. Hersey (1917) describes it as a common nesting bird at St. Michael's. On the peninsula of Alaska it is also a common breeder particularly at the western end and on the south side at Stepovak Bay (Gianini, 1917). Osgood (U.S. Biological Survey) met with the species at Cook Inlet in August, and J. Grinnell (1900) has recorded its breeding on the Kowak River. Farther south, Beck (*fide* Sanford collection) found it nesting at Cape Nome. Dall and Bannister (1867), Brandt (1891) and Willett (1914) have all described it as common about Sitka in summer, but it is doubtful if any breed there.

North America

Alaska

Aleutians

In northwestern Canada the species seems to extend throughout the whole MacKenzie basin. R. MacFarlane (1908) says it is rare at Fort Anderson and on the MacKenzie, though it breeds there, and Stefánsson (1913) met with it to the east of the MacKenzie delta. But the species is certainly not common north of Great Slave Lake. Preble (1908) met with it near Fort Rae, where it was breeding, and saw others on an island in Great Slave Lake. Baird, Brewer and Ridgway (1884) also state that it has been found nesting at Fort Rae and on Big Island, and the maps of the U.S. Biological Survey mark Fort Simpson and Fort Resolution as nesting localities. Cooke (1906) includes Fort Reliance in the summer range. Southward the species was seen near Smith

Northern Canada

Landing and Point Brulé in October (Seton, 1911), but it does not seem to be very abundant about Fort Chipewyan or the Athabasca delta. Preble (1908) speaks of seeing "several" at the former place in May, but Mr. Harper (MS.) saw only two in the region about the delta in spring. Seton (1911) reports seeing it along the Athabasca. In Yukon Territory at Carcross (lat. 60°) there is no evidence that they remain to breed, although the Lesser is a common breeder there (A. Brooks, *in litt.*).

British Columbia

There has been much disagreement as to its status as a breeder in British Columbia. Fannin (*fide* J. and J. M. Macoun, 1909) says they nest east of the coast range, and Kermode (1904) notes that they breed in the interior. Yet Major Brooks, who can certainly be regarded as an authority for this region, told me, and later repeated the remark in print (1920) that he did not believe that any breed there. He has never seen any in summer, excepting a few crippled (?) birds, in the part of the province which he has explored.

It is, I think, very doubtful whether any of the southern records refer to this Scaup, but I note here some evidence, which it seems to me must be further verified.

Alberta

In Alberta, Spreadborough (J. and J. M. Macoun, 1909) found the species breeding to the west of Edmonton. C. B. Horsbrugh (1915) considers it a very common nester near Buffalo Lake. Mr. A. Wolfe thinks that near Edmonton this species is a rather uncommon nesting bird, though the Lesser Scaup breeds there in great abundance. J. and J. M. Macoun (1909)

Saskatchewan

found nests at Crane Lake, southwestern Saskatchewan, and Raine (1892) at Rush Lake. Farther to the north Buchanan (1920) met with the species during May on the Big River, Crooked Lake, Beaver River and Ile à la Crosse Lake, but found no nests. According to

Manitoba

R. MacFarlane (1908) it breeds at Cumberland House. In Manitoba but few breed (E. E. Thompson, 1891) though there are records for Shoal Lake and several localities in the south (U.S. Biological Survey) as well as for Lake Winnipegosis (J. and J. M. Macoun, 1909). On the west side of Lake Manitoba Dunlop (1915) found it the commonest breeding duck. (But is it certain that this was the Greater and not the Lesser Scaup?) The species may nest along the basin of the Nelson River to the coast of Hudson Bay although this is not a good duck country. On August 22 Preble (1902) saw a large flock on the coast between Fort and Cape Churchill. Such summering flocks are, of course, no evidence of breeding.

Farther eastward it is only a sporadic breeder. There are records of its having nested at St. Clair Flats (J. and J. M. Macoun, 1909) and also of its occurrence in summer at various points in the St.

Ontario

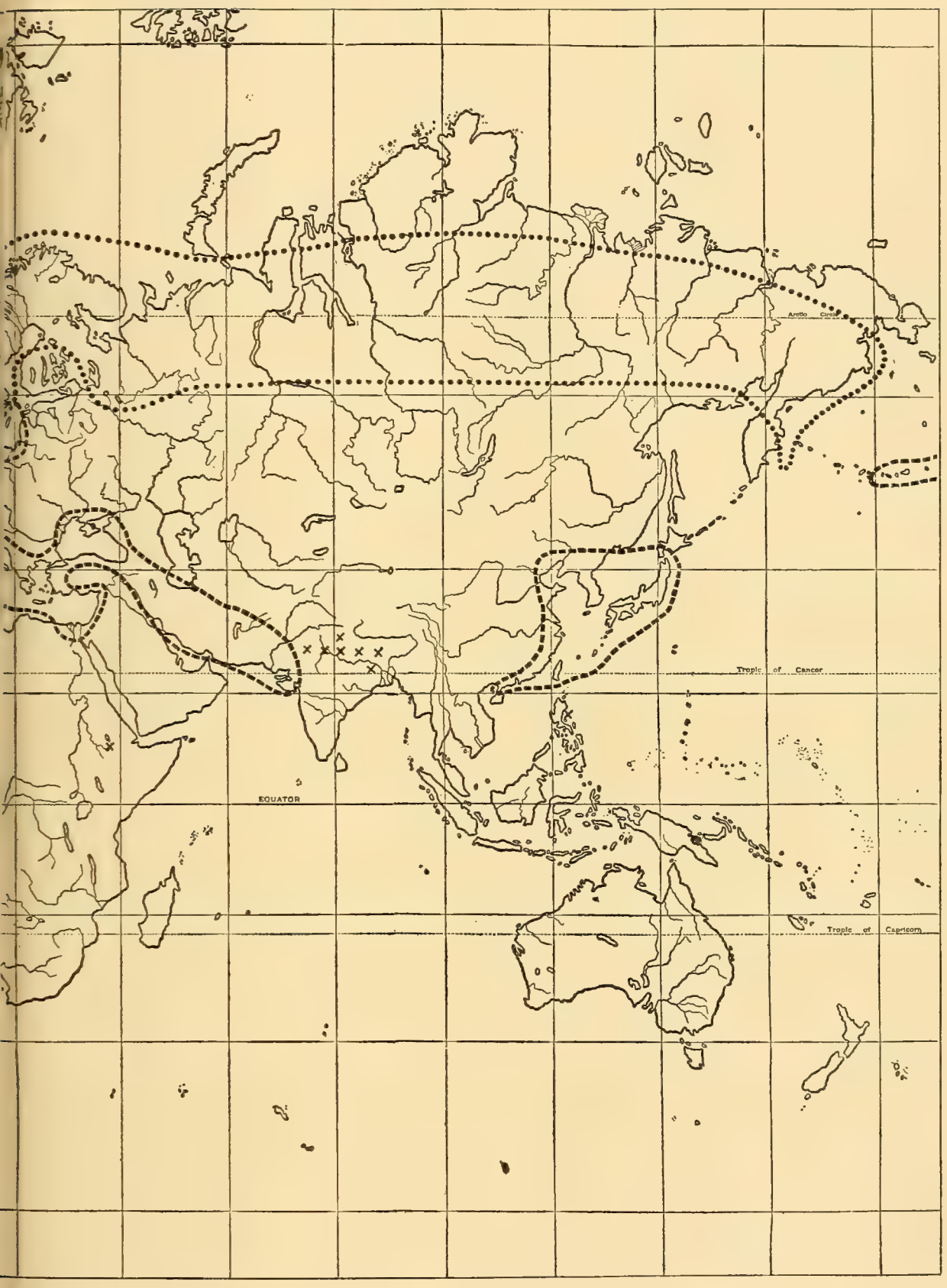
Lawrence basin (Cooke, 1906). It has, however, been several times found breeding on the Magdalen Islands (J. and J. M. Macoun, 1909; Job, 1901), and once in northern New Brunswick (Philipp and Bowdish, 1917, p. 265); but Mr. Bowdish writes me that the parent bird was only a sight record. On a later visit to the Magdalens (1922) Mr. Job told me that he found no evidence of Scaup nesting there. There are isolated summer records for Nova Scotia, Prince Edward Island, Anticosti and Newfoundland (U.S. Biological Survey). Northward a few breed about James Bay (J. and J. M. Macoun, 1909; Bryant, Museum of Comparative Zoölogy specimen) and small numbers spend the summer in northwestern Labrador (C. W. Townsend and Allen, 1907). For the east coast of Labrador there are few records: one for Nain (Bigelow, 1902) and one of two young males taken at Ticoralak in October (Cooke, 1906).

United States

In the United States there are sporadic records of breeding at Billings, Montana (Big Lake) (U.S. Biological Survey); Minneapolis and Fergus Falls, Minnesota (Hatch, 1892; Cooke, 1906); Turtle Mts., North Dakota (U.S. Biological Survey); Lake Koshkonong, Wisconsin (Coon, 1895); Clear Lake, Iowa (Cooke, 1906); and even Mount Vernon, Virginia (Richmond, 1888)! A few non-breeding Scaup spend the summer here and there on the coast of Quebec, New Brunswick and New England. I once shot two out of three males at South Orleans, Massachusetts, in August, the only mid-summer record for the State so far as I remember. A breeding record for Scaups (species?) in Golden Gate Park, San Francisco, California, is scarcely important for the wild-fowl there are in a semi-domestic state and no actual identification was reported.

MAP 88. Distribution o

Breeding range, dotted
Sporadic records



up Duck (*Nyroca marila*)

winter range, broken line
ted by crosses (×)

MAP 88. Distribution of Scaup Duck (*Nyroca marila*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

Europe

The Scaup has never been found breeding in Greenland, but there are a few records of its occurrence on the coasts, one at Godhaven on the west coast (D. Walker, 1860), one at Nanortalik on the south coast (Winge, *fide* Schalow, 1905), one for Angmagsalik (Helms, 1911), two for Stormkap, June 21, 1907 (Manniche, 1910), and one from "northeast Greenland" (Lindhard, 1910). There is also one in the Schiöler collection from Nanortalik (Schiöler, 1912).

Greenland

Iceland

Faroes

Scotland

In Iceland, on the other hand, the Scaup is one of the most abundant breeding birds (H. J. and C. E. Pearson, 1895; Hantzsch, 1905; Millais, 1913; *et al.*). A few nest on the Faroes (H. C. Müller, 1869; Feilden, 1872; E. W. Oates, 1902; Millais, 1913) and on the Orkneys (British Ornithologists' Union Checklist, 1915), while for the rest of Scotland there are records of breeding in Sutherlandshire and quite regularly on some of the islands in the Uist group, Outer Hebrides (Millais, 1913; Witherby *et al.*, 1919–22). There are no other nesting records for the British Isles.

Scandinavia

Finland

On the Continent the Scaup breeds extensively throughout the Scandinavian Peninsula, in the mountainous regions of the south as well as in the more northern parts, even to Varanger Fjord (Nilsson, 1858; Collett, 1873; Palmén, 1876; Hartwig, 1889; Schaanning, 1913; Millais, 1913). In Finland it occurs as a breeding bird chiefly in the northwest, where it has been successively found nesting commonly on the upper Muonio (S. A. Davies, 1905), fairly abundant in May and June about Sodankyla (Finnilä, 1913), rare, but evidently breeding in the Muonio-Enontekis region (Montell, 1917). Palmén (1876) says that it nests even as far north as the Enare region. There are no records of its nesting in Denmark, Holland, Belgium or France, and Hartert (1920a) is skeptical in regard to all reports of breeding in Germany, though Blasius (in Naumann, 1896–1905) says he actually found nest and eggs near Hiddensoe in Brunswick. Other nesting records are certainly all unsatisfactory. There is one record of its breeding in Bohemia, at Reirer Picina, 1892 (Riha, 1892). It has never been reported breeding in Poland, nor in the Baltic States, excepting on the island of Oesel (Loudon, 1910).

Germany

Baltic States

Russia

In Russia the breeding range includes only the northernmost parts. A few nest in Novgorod Government (Bianchi, 1910) and it evidently does so about Lakes Ladoga and Onega (Sievers, 1877). It has been found nesting in Russian Lapland (Goebel, *fide* H. J. Pearson, 1904) and is said by Dresser (1871–81) to do so about Archangel. On the lower Petchora it was not uncommon (Seebohm, 1885). Trevor-Battye (1895) mentions taking specimens on June 16 and July 18 on Kolguev Island.

Asia

Western Siberia

Eastern Siberia

In Asia the breeding grounds of the Scaup lie in the northernmost parts. Nazarow (1887) states that it nests on the steppes northeast of the Caspian on the upper Emba River, but this must be exceptional to say the least. Finsch (1879) found it in the valley of the Ob, north to Obdorsk and Paravatski-Yurti, and Zitkov (1912) has recorded it from the Yamal Peninsula. According to Pallas (1831) it is especially to be found on the lower Ob. To the eastward it is not uncommon and breeds on the Jenesei to 70° 45′ north latitude (Popham, 1897, 1898; Seebohm, 1885). Several were seen near Werchojansk in June (von Bunge and von Toll, 1887) and A. von Middendorff (1853) reported the species breeding commonly on the Boganida. Buturlin (1906) as well as Thayer and Bangs (1914) state that it is common at the mouth of the Kolyma, and Bianchi (1908) lists a specimen taken in the Anadyr Basin in late May. There is at least one actual breeding record for Kamchatka (Kuroda, *in litt.*) and the species is found there throughout the spring and summer (Barrett-Hamilton, 1900; Bianchi, 1909a). Off the coast it nests abundantly on Bering Island, and to a less extent on Copper Island in the Commander group (Stejneger, 1885, 1887; Bianchi, 1909; Hartert, 1920a). J. A. Allen (1905) reports it as very rare on the northeast coast of Siberia, and states that it is said to breed at Marcova. The species probably nests occasionally on Saghalin Island, too. Specimens were taken there at Chaivo, June 18, 1913 (Hesse, 1915) and on the delta of the Susuya, in the south, on May 19 (Lönnberg, 1908).

Commander Islands

Winter Range

During the cold season the Scaup is found exclusively on the coasts or on the larger inland lakes. It is a hardy bird and will hold out anywhere so long as there is open water. In North America it winters commonly as far north as the Aleutians (L. M. Turner, 1886), along the coast of the Alaskan Peninsula, and at Sitka (U.S. Biological Survey), and it is abundant on the coasts of British Columbia and Vancouver (Kermode, 1904; Taverner, 1917), a few occurring inland at Okanagan and Chilliwack (A. Brooks, 1917; also in J. and J. M. Macoun, 1909). Farther south it is still common on the coasts of Washington (W. L. Dawson and Bowles, 1909), though it diminishes rapidly south of Puget Sound and in California is only tolerably common, occurring as a straggler as far south as San Diego (Grinnell, Bryant and Storer, 1918). A few stray birds have been taken in the Hawaiian Islands (R. C. L. Perkins, 1903).

North America

Pacific Coast

Hawaiian Islands

In the interior small numbers are occasionally seen in winter in Nevada (Hoffman, 1881), southern Utah (Cooke, 1906), southern Colorado (Drew, *fide* W. L. Sclater, 1912; Bergtold, 1924), Arizona (Scott, 1886) and southern New Mexico (Cooke, 1906). Others are at times found in the Mississippi Valley north to southern Illinois (Ridgway, 1895), and about the Great Lakes, — Wayne County, Michigan (Wood, 1910), — particularly on Lake Ontario (Fleming, 1906) and on the lakes of central New York (Eaton, 1910; and others).

Interior

Its center of abundance in winter in North America is, however, the Atlantic Coast from Massachusetts to North Carolina. Here it is occasionally met with as far north as New Brunswick (Chamberlain, 1882) and seems to winter regularly in Nova Scotia, sometimes in goodly numbers (H. Lloyd, 1923). A few stay along the coast of Maine but it becomes abundant in Massachusetts, Rhode Island and Connecticut (G. M. Allen, 1909; *et al.*). In New Jersey (W. Stone, 1909) and Delaware (Rhoads and Pennock, 1905) it is abundant, while in Maryland (Kirkwood, 1895), Virginia (Rives, 1890) and North Carolina (T. G. Pearson, C. S. and H. H. Brimley, 1919) it winters in large numbers, especially in the larger salt-water sounds. In South Carolina (Wayne, 1910) and Georgia it is found in greatly diminished numbers, and in Florida it is an uncommon bird, occurring on the Atlantic side as far south as Pelican Island (U.S. Biological Survey) and on the Gulf side to Sanibel Island and Tampa Bay (Bangs, *verb.*; Pangburn, 1919). In western Florida it is reported common in Leon County (R. W. Williams, 1904). Specimens have also been taken at Greensboro, Alabama (U.S. Biological Survey) and it has been even ranked as "fairly common" at Biloxi, Mississippi (Corrington, 1922). In the delta of the Mississippi it is said to be rather common (McIlhenny, 1897).

Atlantic Coast

Gulf Coast

This species is so often confused with the Lesser Scaup that it is well nigh impossible to determine what the southernmost limits really are. It is rare on the north Gulf Coast of Texas (Strecker, 1912), but has been taken at San Antonio (Attwater, 1892), Corpus Christi (U.S. Biological Survey) and even at Fort Brown (J. C. Merrill, 1878) near San Angelo and at Padre Isle (U.S. Biological Survey). McCauley (1877) even said it was common in the interior at the source of the Red River. G. N. Lawrence's (1874) statement that it occurs at Mazatlan, Mexico, and the record of its occurrence in Guatemala (Salvin and Godman, 1897–1904) are probably due to confusion of this species with its smaller relative.

Texas

Mexico

It is equally difficult to say which of the records for the West Indies are correct. The species has on occasion been taken in the Bermudas (J. M. Jones, 1859; von Martens, 1859) and in the Bahamas on Watling's Island and on Rum Cay (Riley, 1905; Todd and Worthington, 1911). Then there are further, in my opinion questionable, records for Cuba (d'Orbigny, 1839), Santo Domingo (A. E. and A. H. Verrill, 1909), Guadeloupe and Martinique (G. N. Lawrence, 1879; Ballet, 1895).

Bermuda

West Indies

Bahamas

Curiously enough, the Scaup does not seem to winter in Iceland (Hantzsch, 1905), though it does so on the Faroes (H. C. Müller, 1869), and on all the coasts of the British

Europe

Faroes

British Isles

Germany

Denmark

Norway

Holland

Belgium

France

Interior

Portugal

Spain

Southern France

Algeria

Tunis

Sardinia

Corsica

Malta

Sicily

Italy

Jugo-Slavia

Greece

Macedonia

Rumania

Russia

Egypt

Palestine

Asia Minor

Caucasus

Persia

India

Isles, especially in the north (R. Gray, 1871; Dresser, 1871–81; Seebohm, 1885; Cordeaux, 1896; H. Saunders, 1899; Ussher and Warren, 1900; Millais, 1913; Witherby *et al.*, 1919–22). On the Continent it is found abundantly on the coasts of Germany, Baltic as well as North Sea (Naumann, 1896–1905), Denmark (Kjärbölling, 1850; G. L., 1918) and southern Norway (Collett, 1873; Schaanning, 1913), and Sweden (Nilsson, 1858). The same is true of Holland (Schlegel, 1859), Belgium (Dubois, 1886) and the northern coast of France (Rogeron, 1903; Ternier and Masse, 1907). It is, of course, almost exclusively a coastal bird in winter, but it is occasionally found on larger inland waters, not only in the British Isles, but in Germany (R. Blasius, 1896; Le Roi, 1906–07; Hesse, 1908), France, Montlucon (des Prugnes, 1912), Switzerland (Fatio, 1904), Austria (Mojsisovics von Mojsvár, 1897), Bosnia (Reiser, 1900), Galicia (Prazák, 1898) and southern Hungary (von Mojsisovics, 1886; Aquila, vol. 2, p. 47, 1895).

In the Mediterranean it is quite rare in the west. I find no records of its occurrence in Portugal, and it is very rare in Spain. Irby (1875) saw a few at Gibraltar, and Vayreda (*fide* Arévalo y Baca, 1887) says it is common on the northeast at Gerona. In Provence it is exceedingly rare (l'Hermitte, 1916). It has not been reported as yet from Morocco, but Loche (1867) says it occurs at Lake Halloula, Algeria, and the Milan Museum has specimens from that Colony. In Tunis it has been found (Lilford, 1895) on the Gulf of Gabes and the neighboring streams (Millet-Horsin, 1912).

It can hardly be described as more than a straggler in Sardinia (Salvadori, 1865; Brooke, 1873), though J. Whitehead (1885) says it is fairly common in Corsica. It is only accidental in southern Italy. Arrigoni degli Oddi (1904) says he has specimens from both Malta and Sicily, but these are the only records I can find for those islands. About the only parts of Italy where it occurs with any frequency are Lake Garda and the Venetian lagoons (Giglioli, 1886; Arrigoni degli Oddi, 1904).

On the eastern side of the Adriatic it is not rare in Dalmatia (Kolombatovič, 1903), but it is very uncommon in western Greece (von der Mühle, 1844; Lindermayer, 1860), if it occurs at all (Reiser, 1905). Farther east, however, it increases in abundance. Elwes and Buckley (1870) found it not rare in Macedonia and Danford and Harvie-Brown (1875) say the same of Transylvania. The species no doubt winters all along the littoral of the Black Sea. Valkh (1911) says a few winter in the western part of Ekaterinoslav, southern Russia, and Kennedy (1921) said it was numerous on the bay at Novorossisk, Kuban.

According to von Heuglin (1873) he found the Scaup not rare in lower Egypt and Arabia Petræa, and even took one pair in December in Abyssinia. This is an unusual statement. A. E. Brehm (1854) had seen it on Lake Menzaleh at an earlier date, and both Cecil (1904) and Whymper (1909) say it occurs in the Delta, but so good an authority as Nicoll (1919) confesses that he never saw or heard of a specimen in Egypt. It does, however, occur on the coast of Palestine (Tristram, 1884), and is not rare on the coasts of Asia Minor (Braun, 1908).

Radde (1884) states that the Scaup winters on Lake Gotschai in the Caucasus, as well as at Baku, though it is rare at Lenkoran. Seebohm (1883), Loudon (1910) and Zarudny (1911) have all reported its occurrence on the south coast of the Caspian, the last-named writer stating that it winters also in the Zaragoss and Mesopotamian regions of Persia, and in the Seistan, though it is rare on the littoral of the Persian and Arabian Seas. It is one of the rarest ducks in India, though very possibly many immature birds are overlooked there. So far it has been recorded from Kashmir, Kullu and Nepal (Hume and Marshall, 1879), from Attock and Gurgaon, near Delhi, from Sind (Karachi) and possibly Bombay (Blanford, 1898), Calcutta (?), Chittagong, Lakhimpur and Oudh (Baker, 1921).

Farther east it is found commonly all along the coasts of China, about Hong-kong (Vaughan and Jones, 1913), Amoy (R. Swinhoe, 1860; Kershaw, 1904), Foochow (R. Swinhoe, 1862; La Touche, 1892; Martens, 1910), more sparingly on the lower Yangtse (Styan, 1891) and Kiau-chow (Kleinschmidt, 1913). Others winter in Korea (C. W. Campbell, 1892) and in the interior as far north as the southern end of Lake Baikal (Radde, 1863). In Japan it probably winters throughout, and specimens have been recorded all the way from Saghalin and Hakodadi to Nagasaki and Tanegashima in the Loo-choo group and to Korea (Blakiston and Pryer, 1882; Seebohm, 1892; Ogawa, 1905; Kuroda, *in litt.*). It has also been recorded from Formosa (R. Swinhoe, 1863) and has once been taken on Luzon in the Philippines (R. C. McGregor, 1909).

China

Interior

Japan

Philippines

Migration

In the New World the Scaup Duck seems to be much more of a northwest-southeast migrant than many of the other ducks. The seasonal movement in the Mississippi Valley appears to be much less important than the one from the Great Lakes to Chesapeake Bay and the neighboring regions. No observations have been published in connection with the distribution of sexes in winter in this country, but on Lynn Bay in Massachusetts, almost the northern limit of the wintering range on the Atlantic coast, I have noted a tremendous preponderance of adult males over females and young, the proportion being about three to one; sometimes five to one. Farther south, on Pamlico Sound, Dr. H. B. Bigelow tells me that the reverse is true, and that in some years the brown birds (females and young) outnumber the adult males fully five to one. Dr. A. A. Allen writes me that at Lake Cayuga, New York, the excess of the males over the females is not so marked as in the case of the Canvas-back. The ratio he estimates at about three to two. Adult males, he says, are scarce there. From notes made by Major Allan Brooks at Comox on the east coast of Vancouver Island on February 10, 1920, it appears that there the males outnumbered the females fully seven to one. At the same place on the last day of February the sexes were as fourteen to three. In the interior of British Columbia, at Okanagan Lake, on March 17, the males still comprised 65% of the total.

North America

A great excess of males has been reported by various European writers. It does not seem certain that the males always winter farther north. For example, Radde (1863) says only young birds winter on Lake Baikal. Young birds have been noticed as preponderant in Ireland (W. Thompson, 1851) and in Greece (von der Mühle, 1844). In the market of Angers, France, Rogeron (1903) also found chiefly young birds.

The Scaup is a hardy bird, and does not move south until the waters freeze. In the spring, on the contrary, it stays late on the wintering grounds, due, no doubt, to the fact that its breeding grounds in the far North do not break up until May and June. On the Atlantic coast it shows a tendency to move slowly north in the spring, not cutting inland, it seems, until it has reached the latitude of New England or even farther north.

In consequence of these peculiarities the Greater Scaup cannot be spoken of as common, even on migration, anywhere in the interior of our country, excepting in the Mississippi Valley and in those States lying between the Great Lakes and the middle Atlantic coast. The Pacific coast birds seem to come to the coast very far north, and do not cross over the interior of our West. As already remarked, the species stays late in the spring. On Long Island Sound they are most abundant about April 10, and on Lake Erie (Long Point) Blue-bills of both species are very numerous in the first half of April. I have seen them around Boston up to the very end of the mouth and even then they did not seem to be paired. They do not, however, reach their breeding grounds in northern Canada and Alaska until May or early June. In the autumn they leave the breeding grounds late in September or early October and are seen passing over the United States throughout the latter month. On the Chesapeake they do not appear in numbers till the very end of October and in November.

Two adult birds banded at Ithaca, New York, in March, 1920, were trapped on December 10 and 18, 1920, at Union Springs and Levanna, respectively, in the same State (U.S. Biological Survey).

Europe

From a careful perusal of the literature I should say that there is some evidence to show that in Europe the Scaup has a more easterly migration in spring and a more westerly one in the autumn. Throughout Russia, where it is a common migrant, it is far more abundant in spring than in fall, while in many western European countries just the reverse is true. There is also considerable evidence that the females and young of the species winter somewhat farther south than the adult males. In the extreme west the spring migration is rather early. They leave the British Isles from the end of March on, and may be seen in Iceland almost at the same time. In central Europe most of the birds pass in March (in Russia in April and May), but do not reach the breeding grounds in northern Finland before late May or early June. In the autumn the Scaup put in an appearance very late. October and November are the usual months of arrival in the British Isles, while in central Europe November is the more usual month. In Russia the autumn passage is naturally somewhat earlier, most of the birds passing over late in September or during October.

Asia

We know nothing of significance concerning the seasonal movements in Asia. A. T. von Middendorff (1853) says they arrive on the Boganida on June 16, and Radde (1863) noted that only young birds wintered on Lake Baikal. On Bering Island the Scaups began to arrive about late April or early May, while in the autumn K. H. Jones (1911) noted immense flocks near Wei-hai-wei, China, during the end of August, which seems a very early date indeed.

GENERAL HABITS

The name Scaup for this common, and often more or less despised duck has two possible derivations. It may come from the term *scaeps* or *scaups* meaning shells or beds of mussels suggestive of its food habits (Willughby and Ray, 1678; Swann, 1913). Another and quite as likely an explanation, favored by some good English writers, connects the name with the hoarse, croaking note common to the female. However this may be, the term is an old one in England although very little used in America. Here we call it the Broad-bill, Blue-bill or Big Blue-bill to distinguish it from its smaller cousin the Lesser Scaup, or Little Blue-bill.

The Scaups, although typical fuliguline ducks, represent a group standing somewhat apart from the Pochards. The shape of their bills is peculiar, very broad, short and spatulate, and the down-color of the young is dark, almost black, easily distinguishing them from the young of the Pochard, Red-head, Canvas-back or Ring-necked Duck. Then there is a point as to their plumage which I do not find commented upon, but which distinguishes the Scaups at once from the true Pochards and some other diving ducks. This is the pure white of the lower parts, even in the first feather, so different from the gray, streaked appearance of the lower abdomen in the immatures of most other species. The habits too are distinctive. The Scaup is a salt-water bird, almost as much so as the Scoter tribe and he can feed in deeper and rougher water than the Pochards and the White-eyes. Besides he is a more rugged bird in every way, more like the Scoters and Eiders in this respect, and is capable of withstanding the most arctic weather. His distribution conforms more with that of the far-northern sea ducks, than with that of other ducks of the genus. In

fact one is somewhat tempted to leave the two Scaups in the genus *Marila* in order to call attention to their peculiarities, if it were not for the existence of other species more or less connecting them with the Pochards.

In their voice and courtship activities Scaups are also somewhat different from other diving ducks, especially the Pochards.

Another point which ought to be mentioned in connection with Scaup is the presence along the coastal regions, even far from breeding grounds, of great numbers of non-breeding birds. It takes both sexes a long time to reach maturity, and it is safe to say that a great many do not breed until their second year. The distribution of the sexes during autumn and winter presents a very complex problem, noticed under Migration, and thus far I am afraid we are in no position to offer any adequate explanations. In some places it seems as though the females and young certainly winter farther south; at other points the sexes and ages are distributed in different waters of the same general region.

Wariness. I do not think the Scaup can be considered anything but a stupid duck, not so stupid as the Scoters or Ruddy Ducks, but rather more so than the Pochards and White-eyes. The English punters recognize them as easily approached on the water and usually very loath to fly unless alarmed by more wary species, preferring to scatter out in a long row and swim ahead of the approaching punt. On our own lakes I have sculled to a great many, or even paddled down upon young birds in October in a canoe without any trouble at all. Later on, of course, they are wilder, especially when gathered into large flocks upon their winter feeding grounds. But it is the habitat of this duck and not its own disposition that really protects it. Staying out over deep water or endless banks and flats and seldom crossing points or beaches in its morning and evening flights it is naturally well protected. In some places I know about, it is almost impossible to get at them, and they spend the whole winter in peace and security. The larger the flocks the more difficult to approach, as a rule.

Daily Movements. In most places in winter the Scaup moves in and out with the tide, resting when the sea is full and either drifting or flying toward the flats while the tide is dropping. At least this is the way they act when left to their own diversions. But if greatly disturbed during daylight hours they become quite nocturnal and rest in the open sea all day long. They may be classed as at least partially nocturnal and certainly they are capable of doing most of their feeding at night, when hard put to it. Presumably they feed more on bright nights than on dark ones. Seebohm (1885), speaking of the Petchora River, says that Scaups are especially active when the sun shines from the north, meaning, of course, during the bright arctic night. On their fresh-water breeding grounds, they are independent of tide and the affairs of men.

W. Thompson (1851) describes the noise that they made on a calm night in feeding in the shallow pools exposed at low water on the sea-banks of Belfast Bay as resembling the sound of a waterfall.

Scaup sometimes move into lakes lying near the coast in severe weather on the flood tide, and they do in fact often resort to fresh water quite regularly when it is near the sea.

Gait, Swimming, Diving. The gait is clumsy and waddling but perhaps no more so than that of the Pochards. Although they certainly do not often "haul out" on land I have seen them sitting on the bare point of a marsh in a certain bay in Massachusetts. I think this happens only seldom, more commonly toward spring. Millais (1913) speaks of having once seen a whole flock come in at low tide and alight right on the flats among small pools and rills. In February, 1923, after a very hard winter, I saw flocks of apparently very hungry birds do the same thing. They came in from the bay and alighted on bare mud or in water only an inch or so deep, where they fell to shoveling their bills along in the mud, like any surface-feeder. And the curious thing about it was that they had not the slightest trouble in landing on the bare flats, doing so as cleverly as Black Ducks.

These ducks swim rather low in the water except when asleep or resting, when they appear much more buoyant.

They dive even more actively than Pochards and White-eyes; that is, they can feed in even deeper waters and stay under longer. The wings are not used in propulsion under water, at least not by healthy birds, and Alford (1920) says that the tail is spread and the legs shot out at right angles as with other diving ducks. I do not know the maximum depth at which this duck is able to feed. It prefers depths of four to ten or twelve feet, but can doubtless reach bottom up to fifteen or twenty feet. Twenty-one feet was the greatest feeding depth that Dewar (1924) observed. Naumann thinks 5.5 meters is about the limit. The ordinary period under water depends, of course, on the depth, but from 15 to 30 seconds is the length of an ordinary dive and 50 to 60 seconds has been recorded (Cordeaux, 1896). This last is certainly exceptional. The longest that Dewar recorded was 49 seconds. I have seen them making very short dives of six or seven seconds in very shallow water. When these and other species are actively feeding the time taken up on the surface is only from one-half to two-thirds as great as the time consumed underneath, but the greater the depth the longer the pause between dives.

Flight. This is not very different from that of other diving ducks. The start is slow and "pattering" if the weather is calm, the first part of the flock rising long before the hindermost ones get under way, and the noise of a big raft starting to move can be heard for miles. In a good breeze less effort is necessary.

Many writers have spoken of the lack of formation in huge flights of Scaup and as I think of it I feel convinced that they do not tend to thin out into the fine lines and wedges assumed by Canvas-backs and Red-heads. When they are well up in the air it is extremely doubtful whether the keenest observer can tell them from Red-heads, unless the color of the birds can be seen.

Although there is no very sharp whistling noise from the bird's wings there is the loud rustling sound which comes from any large-bodied fowl moving swiftly through the air.

Flocks are often very large indeed, especially on the water, and it is no uncommon sight to see from one to two thousand in a loosely formed bunch even on the coast of New England. Payne-Gallwey (1882) has often seen 2000 to 3000 together in Ireland and rafts of 5000 to 10,000 strong have been seen on the North Pacific coast (W. L. Dawson and Bowles, 1909). A flock on the Solway Firth, Scotland, which was carefully measured, proved to be one and a quarter miles long and from 60 to 100 yards in width, the birds closely packed (Armistead, in Gladstone, 1910).

Association with other Species. The Scaup is not especially sociable with other species although extremely gregarious. The name "Flocking Fowl" and "Raft Duck" have been given to it on this account. On the nesting grounds it is much more sociable than most ducks, behaving almost like the Eider in certain places, as in Iceland.

On the winter quarters in western Europe it feeds mostly with Golden-eyes and Scoters, not mixing very closely with Widgeon, who inhabit rather different waters. If there are Tufted Ducks or Pochards about they may mix more or less with them. The same is true of our own North Atlantic coast, where they are in some bays almost the only duck that winters in any great numbers. Farther south on our coast they mingle with Red-heads more or less, and on Pamlico Sound, especially late in the season, there is a great deal of mixing with this latter species, both on the water and in flight. E. J. Lewis (1855) noticed their association with Canvas-backs but on the whole the Canvas is a fairly independent duck and probably that association is mostly accidental.

This duck migrates rather later than the Lesser Scaup and there is not a great deal of intermingling during the autumn flight. Still there is some, for I have shot into mixed flocks of migrant Scaups many times at Wenham, usually one or two immature of the Greater with a larger number of the "Lesser" species.

On the Petchora River in the nesting season it mingles with Pintail, Widgeon and Teal (Seebohm, 1885). In Iceland, where at Myvatn Lake it nests almost in colonies, a Scaup and a Long-tailed Duck were once found sitting on the same nest (Shepard, in Baird, Brewer and Ridgway, 1884), and many Mallard and a few Widgeon, Pintail and Teal nest there among them (Millais, 1913).

Voice. Almost all sportsmen are familiar with the loud, hoarse note of the female Scaup, but very few indeed have heard the dove-like cooing call of the male. Many observers have thought the male an absolutely silent bird; the explanation is that this soft note carries only a short distance. The first and one of the best descriptions that I can find is that of Faber (1822), but recent writers have generally failed even to mention it. This note, which is primarily a courtship note, may sometimes be heard at other seasons than spring, even in late autumn. I have heard it in November. It is best described as dove-like in quality, a short explosive *cu-coo,* the last syllable strongly accented. At times it is practically inaudible and I feel certain it is uttered more commonly than would appear to be the case. Both Audubon and Goss (1891) evidently heard it. Allan Brooks likened it to the note of the Burrowing Owl.

The female has several notes, the usual one being a rattling *kaup-kaup* (Cordeaux, 1896) or perhaps better, a *karr, karr, karr* (Naumann, 1896–1905). Millais (1913) heard a wounded male uttering a harsh note like the female's, but I have never heard anything of the sort from the male. Other writers, like Seebohm (1885), have spoken of the male's "loud, harsh scream," but I cannot help thinking that these observers were mistaken as to the sex. It may be possible that young males are able to make a noise resembling that of the female; on this point I am not entirely satisfied.

The trachea of the male is slightly swollen and flattened throughout its middle and upper part, being smallest at the lower end. The labyrinth is left-sided, large and flattened, its good-sized apertures covered with drum-like membrane. In general structure it resembles the analogous organ in the Common Pochard, the Southern Pochard and the Ring-necked Duck (see plate in Latham and Romsey, 1798, and other more recent writers).

Food. The ordinary food of this duck when on its winter quarters in salt-water bays and estuaries is largely animal. It consists of great numbers of small shell-fish, both univalve and bivalve, with vegetable matter, particularly the seeds of *Zostera* and widgeon-grass (*Ruppia*). Minute crustaceans are also a favorite food. Fish appear to be rarely taken, although in captivity the Scaup feeds freely on salt-water minnows (*Fundulus*) up to two or three inches in length. Scaups collected in Massachusetts in January and February by the U.S. Biological Survey, contained only about 3.17% of scallops, so that the damage to edible shell-fish on the New England coast is probably negligible.

In fresh water they feed freely on wild celery (*Vallisneria*) and pond-weeds (*Potamogeton*), particularly the seeds. Their stomachs are usually well supplied with broken-up shells and gravel, and pebbles up to half an inch in diameter have been recorded.

Stomachs of Scaups feeding both in fresh and in salt water, shot by myself on a pond on Martha's Vineyard, November, 1919, and examined by Mr. Kubichek of the U.S. Biological Survey, showed a great deal of vegetable matter, mostly *Potamogeton pectinatus*, with a trace of *Chara*, bivalves, mostly common blue mussels (*Mytilus edulis*) with gastropods, *Littorina*, *Odostomia* and *Nassa*. O. W. Knight (1908) mentions stomachs from Maine which, besides the usual food, contained "millions of small crustaceans of the surface-swimming varieties." Mr. O. Bangs tells me that on the west coast of Florida at Sanibel Isle he watched some Greater Scaups feeding on the beach, running up and down between waves and picking up the large sand-bugs (*Hippa*) that abounded there. This seems a very unusual feeding habit for any diving duck.

One taken at San Diego, California, contained 450 seeds of widgeon-grass, *Ruppia maritima* (Grinnell, Bryant and Storer, 1918).

European food appears to be precisely the same, judging from stomach analyses quoted by W. Thompson (1851), Naumann (1896–1905), Seebohm (1885), Cordeaux (1896), Lilford (1895), Slater (1901) and Fatio (1904). In the summer they eat great quantities of insects, a few young trout, small fresh-water snails and water-plants (Millais, 1913).

When Scaup are feeding on large mollusks, as they often do with us in late winter and early spring, I have watched them at very short ranges and found that nearly all of them came to the surface with the shell-fish in the bill; after rising, the morsel which is held midway of the mandibles, not between the tips, would be readjusted by a rapid motion and then very quickly swallowed. A few sips of water were taken at the same time.

Courtship and Nesting. As a rule, during migration or among wintering birds which remain on our shores till April, very little pairing seems to have taken place. I have never seen any signs of courtship in large flocks I have watched up to the middle of the month, but Dr. C. W. Townsend tells me that he once in April saw among a group which consisted of one-third males and two-thirds females, evidences of display activity on the part of the males. There is no doubt that these and other diving ducks pair much later than the surface-feeders, at any rate, there is always a large proportion of non-mating birds among them. Furthermore it seems likely that these birds do not permanently pair till they have arrived on or near the breeding grounds.

The display of the male is neither graceful nor spectacular. Two early writers (Montagu, 1813; Faber, 1822) mentioned the essentials of it, namely, the cooing voice and the peculiar head-toss accompanied by the opening of the bill. It has also been well described by Cordeaux (1896) and by Millais (1913). Among my own specimens in confinement I have observed it about the middle of May, though never

in the early spring. The actual motions of the males consist only of an inflation of the neck accompanied by the low dove-like note, often inaudible, and in a throw-back of the head, which, however, is never carried beyond the perpendicular position; that is, it is never tipped over as it is in the Pochard and the Golden-eye. If the female responds to this, says Millais, she also lifts the neck stiffly, at the same time uttering a crooning sort of note, like the words *tuc-tuc-turra-tuc*. Sometimes the female utters her harsh call, and I have seen them making snapping movements with their bills. To quote Millais: "The actual show of the male is a quick throw-up of the head and neck, which is greatly swollen with air as it extends. At the summit of extension the bird utters a gentle cry like the words *pa-whoo*, only once. As he makes this show, the female sometimes swims around him, lowering the head, dipping the bill in the surface of the water, and making a gentle call, *chup-chup*, or *chup-chup-cherr-err*. Quite as frequently the cry of the male is uttered after the head is raised and slightly lowered. The male also utters a very low whistle." This last note I have never heard.

Riemschneider (1896) who, writing of Iceland, gave a good description of the curious dove-note which so few seem to have heard, adds that there is evidently very little rivalry or squabbling, the courtship being tame and lacking animation, in great contrast to the behavior of the Long-tailed Duck.

Over nearly the whole of the nesting area the breeding season is late, extending from about the 7th of June to the end of the month as a rule. It is true that in some warmer coastal localities or in regions not so far north, nests have been found in May. On the Yukon delta, for example, Nelson (1887), found eggs in the last days of May, and Bianchi (1909) has recorded nests from Bering Island taken at the same time. Over most of Alaska they do not nest until later. In Minnesota and in Manitoba, eggs (Greater Scaup ?) have also been taken in May (Cooke, 1906). But the bulk of them nest in June, and late clutches are not uncommonly found early in July (H. J. and C. E. Pearson, 1895; Slater, 1901; E. W. Oates, 1902).

The Scaup chooses a variety of locations for its nest and seldom confines itself to beds of rushes as the Pochards do. The nest is often in rough, broken country, hidden among bushes or large stones or in hollows in the ground. Quite often it is found under willow, beech or juniper scrub, but frequently it is in exposed situations. Although usually very near the water, it is rare to find the nest built over the water. On the whole the Scaup prefers dry islands on the banks of which the nest is placed. This last is only moderately well concealed, at least it appears to be easy enough to find where the birds nest in numbers, as in Iceland. There, where they are protected, they make no attempt at concealment and the nests become very prominent when the down is added.

Among the unusual nests that have been described may be mentioned one on the tundra of Alaska one quarter of a mile from the nearest lake, and another four inches

above water in marsh grass thirty feet from a pond (J. Grinnell, 1900). On the Magdalen Islands two nests were found placed in a bunch of rushes growing in the water (Young, in J. and J. M. Macoun, 1909). Riemschneider (1896) found nests in Iceland placed in crevices of the lava beds, some one or two feet or even an arm's length in depth.

The ordinary nest is very unpretentious, usually only a hollow in the ground lined with dry vegetation picked up in the immediate vicinity, and supplied with down by the female.

Quite the most remarkable characteristic of the species is its gregariousness on the breeding grounds. In Iceland, on Myvatn Lake, there are colonies which resemble closely those made by Eiders. Many nests are found there so close to each other that they actually touch. Millais (1913) found over one hundred Scaups nesting in an area of three or four acres near a farm. In many cases two or three nests were touching one another, while in others two Scaup nests could be seen with a Mallard or Widgeon sitting sandwiched in between. An even more remarkable assemblage is mentioned by Slater (1901). He tells of a certain Mr. Thomas Carter finding on one small group of islands in Myvatn 305 nests of the Scaup.

A curious point is that these birds are not sociable with other species, in fact they are quite exclusive and monopolize some of the islands. Thus Krüper (1857) says that among 134 eggs taken on one small island on June 23 only three were eggs of Barrow's Golden-eye and six to eight eggs of the Long-tailed Duck. The rest were all Scaups' eggs.

In Iceland the clutches vary from eight to eleven, averaging about nine. In Alaska, Nelson (1887) considered clutches of more than eight unusual. Larger clutches are not infrequently found in Iceland. These are probably the work of two females. As many as twenty-two have been found in one case, although the district had been collected in only eight days before (Krüper, 1857).

Although it is not unusual for clutches to be mixed, there are only one or two cases on record in which other birds have laid in Scaups' nests. In Saskatchewan (Scaup species ?) one nest was found containing nine Scaup's eggs and two of the Canvasback (J. and J. M. Macoun, 1909). Mr. C. W. Shepard (northwest peninsula of Iceland) says that on the Myvatn he found a female Scaup and a female Long-tailed Duck sitting on the same nest, which contained a number of eggs of both species. In other cases Riemschneider (1896) states that the Scaup has been known to lay eggs in the nest of the Red-breasted Merganser, the nest in this case being somewhat larger than usual, and the down being supplied by the Merganser. He found no instances of Mergansers laying in Scaups' nests, however, though he was told that in the cases of communism mentioned above both females incubated.

The eggs are dull drab to olive gray, almost like the typical pheasant egg in color. They may very easily be confused with those of the Pochard, Lesser Scaup or Ring-

necked Duck. The average measurements of one hundred eggs mentioned by Hartert (1920a) were 61.94 by 43.65 mm. Riemschneider (1896), who says he measured far more than one hundred, gives the average as 63 by 43 mm. The maximum length and breadth given by Hartert are 68.1 and 48 mm., the minimum 54.5 and 40.7 mm., respectively. Riemschneider mentions an abnormally small egg measuring only 46 by 34 mm. The nest-down is as large as that of the Mallard, dark brown to blackish, without pale tips, but with inconspicuous white or brownish-white centers (Seebohm, 1896; A. C. Jackson, 1918).

There are very few notes as to the length of the incubation period. Hantzsch (1905) considers it "about four weeks," but Mr. A. Wolfe of Edmonton, Alberta, writes me that he has hatched Scaup eggs under a hen in twenty-two to twenty-three days. In fact nearly all the diving-duck eggs which he has handled hatched in from twenty-one to twenty-four days. If artificial heat was used they hatched even sooner than under hens. I must confess that the shortness of this period was at first very surprising to me and I was unable to explain it. Later, however, I got some accurate data from Mr. Wormald which points to a short period, for rather stale eggs which he got from Iceland came out in from twenty-five to twenty-seven days and they would certainly take longer than fresh eggs under natural conditions.

Some interesting accounts of the behavior of the parent birds during and after incubation may be found in the literature. Like other ducks the female Scaup covers the eggs when she voluntarily leaves the nest. This is done by a few rapid movements, after which she runs a few paces toward the water in a stooping attitude; raising the head and neck and taking a good look around, she appears satisfied and waddles slowly to the water (Millais, 1913). Krüper (1857) and Riemschneider (1896) assert that when frightened from the nest the female always soils the eggs in Eider-duck fashion!

Although at first the males remain in the vicinity of the nest, they flock together after incubation has commenced. Hantzsch (1905) thinks that even after flocking they sometimes rejoin the female at night and he even thinks that the sexes are loosely associated after the young are hatched. The Pearsons (1895) also state that they have seen the male with the family in a few instances. Such cases are, however, exceptional and one can never tell whether the male is really the mate of the female in question. Millais (1913) particularly remarks that he never saw any male come near the female after she had hatched her young. He adds that there were a few males, doubtless the husbands of sitting ducks, on the river below his camp (Iceland) but they never took the smallest notice of any females with young that came near them.

There seems to be a tendency for the various families to pack together, as Eiders and Mergansers do. In Alaska Nelson (1887) noted that in some ponds six or eight families were united. The young grow quickly and are on the wing in five or six

weeks. When alarmed the female flutters off a short distance, continuing to utter a hoarse *br-räh;* the young respond with a fine *krkr*. There is a great and unaccountable mortality among the young. Hantzsch (1905) says they could not have died of hunger, as their stomachs were filled with a considerable amount of vegetation, especially small narrow leaves, in addition to many small stones. In his opinion cold or parasites must have caused death.

It is interesting to note that in Iceland the males seem to rejoin the flocks in early September, after which the reunited families resort to the coast, but they leave it for good in late October (Hantzsch, 1905). This is rather extraordinary in view of the inequality in the numbers of the sexes and ages both during migration and on the winter quarters.

Status. Any exact estimate of the status of this Scaup in America is quite impossible at the present time, because in the records of shooting-clubs, State Commissioners, and individual sportsmen, the Greater and the Lesser Scaup are usually lumped together under one heading. It is, however, still an extremely abundant species on migration and in winter on the North Atlantic and Pacific coasts as well as on many of the greater lakes. I should say that a much smaller proportion of them are killed than of Lesser Scaup, Ruddy Ducks, Red-heads or Canvas-backs. The fact that they do not migrate particularly early and that they remain for the most part well to the north gives them the advantage of a short shooting season, in some places not more than a month to six weeks. Then again, the species has never been pursued persistently in waters such as the North Atlantic coast where there are no valuable species to be had. Where they happen to be mixed with Red-heads or Canvas-backs, as they are from Chesapeake Bay to Pamlico, they have to take the same punishment as their more desirable relatives. Their breeding grounds, so far as we can see, will always be fairly undisturbed, which is an important point in their favor. I can think of only one serious menace to the Scaup at the present time, and that is the constantly increasing pollution of our bays and harbors by the waste oil pumped from the tanks of oil-burning steamers or leaking from stationary tanks on shore.

On the whole the diving ducks have responded less well to increased protection than the surface-feeders, and this is especially true of the Red-head, Lesser Scaup and the present species.

An idea of the enormous numbers of Greater Scaup which winter even along the most thickly settled parts of the New England coast may be obtained by any one who takes the trouble to visit the outer harbors of some of our large cities from late November to early April. In the little bay at Lynn, Massachusetts, there are usually from 1800 to 2500, sometimes up to 3000 or 4000; in Boston Harbor well over 3000; while at Warwick, Rhode Island, as many as 6000 to 10,000 have been counted in a

day. The same great flocks are seen along the coast of Connecticut. Even as far north as Geneva, New York, 600 have been seen in mid-winter, and in southern Nova Scotia bunches up to 300 or 400. Huge bodies winter off the mouth of the Connecticut River, in parts of Long Island Sound, the Great South Bay, and on the coasts of New Jersey and Delaware.

Over the interior, in such States as Minnesota and Michigan, it is very difficult to get an idea of the proportions of Greater to Lesser Scaup. Barrows (1912) says that in Michigan, presumably on autumn migration, nine out of ten Blue-bills are of the Lesser species and only one of the Greater. But both Blue-bills together ranked higher in numbers than any other duck in Minnesota in 1919.

On the Pacific coast the center of abundance is the coast of British Columbia and Washington. W. L. Dawson and Bowles (1909) speak of having seen rafts of 5000 to 10,000 on Puget Sound.

In Alberta, in the breeding season, it was said by C. B. Horsbrugh (1915) to be second only to the Mallard in numbers, and Mr. Mershon writes me about the same locality that there are still great numbers to be seen there on migration, though less than there were thirty or forty years ago. He says the same about Michigan.

It appears to be only a very rare breeding bird about Edmonton and over all of southern Canada and curiously enough, it is comparatively rare on the Athabasca delta, where the Lesser Scaup was the commonest duck (Harper, MS.). Farther north, all along the MacKenzie valley, it does not seem to be anywhere plentiful, but when we reach the Yukon delta, and the warmer breeding grounds of western Alaska, it is again a very abundant nester, at St. Michael's the third most abundant duck (F. S. Hersey, 1917).

To sum up I think we are a long way yet from mapping the exact status of this duck, particularly on its breeding area.

The tremendous numbers of Scaup nesting in Iceland have already been discussed in another connection. Great numbers of these birds spend the winter on the coasts of the British Isles. Thousands are at times seen on some of the favorite estuaries on the north coast of Ireland and the east coast of Scotland and England. Equally large numbers pass the cold months on the Baltic coasts.

Mr. Kuroda writes me that the Scaup winters all the way from Saghalin Island to Formosa and Korea, and that it is very abundant in Tokyo and Mikawa Bays in Hondo, and in Hakata Bay in North Kiusiu.

ENEMIES. The Skua Gulls are perhaps the most destructive enemies of this and other species in Iceland, where they prey on the young (Millais, 1913). The Common Crow is probably most destructive to the eggs in our own Northwest. An enemy perhaps not often suspected is the common Goose-fish (*Lophius piscatorius*). Dr. H. B. Bigelow tells me that at Hatteras Beach, North Carolina, he found the

body of a Scaup inside one of these predaceous fish. The Goose-fish is known to take Scoters, grebes, loons and other water birds.

Food Value. If one reads far enough in the sportsman's literature one can find plenty of recommendations for the flesh of even the poorest ducks. Such is the case with the Scaup. The specimens which I have shot on the pond at Wenham, Massachusetts, seemed to have come from the interior, for they had not fed on mollusks and did not smell or taste rank. But these migrants are usually not fat and their flesh is always comparatively dry and tasteless, and far inferior to that of most ducks. Birds shot on the coast, both here and in Europe, especially old birds taken late in the season, may be fat, but they are strong, rank and by no means delicate in texture. Very few writers have a good word to say for them, though they are, no doubt, appreciated in localities where even Scoters are considered fit to eat, as on Cape Cod, Massachusetts. There are, however, certain waters on our coast where the Scaup is by no means to be despised. On the Chesapeake they enjoyed an excellent reputation in the old days, if they were feeding with Red-heads and Canvas-backs (E. J. Lewis, 1855), and on the fresh-water sounds farther south their flesh is excellent. In Pamlico Sound, which is nearly salt water, they are considered about equal to the Red-head, but I did not find them so myself. Shot on the same waters and eating some of the same food they were, I thought, coarse and strong.

Hunt. In America Scaups are shot almost entirely over wooden decoys, and as there are few places where they fly across points or beaches the sportsman resorts to sink-boxes and bush-blinds, floating or thrust into the mud, where a boat can be concealed. In most of our northern Atlantic waters the battery-boat or sink-box is forbidden by law, and in consequence the Scaup leads a life of almost uninterrupted pleasure.

This duck responds readily to tolling with a dog, in fact it was more easily enticed to the shore by this method than either the Red-head or the Canvas-back. This method, which was used in the Upper Chesapeake a hundred years ago, has long since been given up. Giraud (1844) tells of decoying Scaup by having a dog trained to swim between the ducks and the shore and also by waving a red handkerchief every few seconds.

The Indians used to take them with flight-nets set up in some of the narrow places in Puget Sound, Washington, according to W. L. Dawson and Bowles (1909).

They respond very well to a flock of wooden decoys pulled out into a lake on an endless line and worked in to shore ahead of a swimming flock. They show every evidence of curiosity and for no particular reason will often swim up close to a beach upon which live Mallard decoys are swimming or playing, merely to "look things over."

I have had fine shooting in March by tying out a flock of wooden decoys near the end of a long stone breakwater guarding the mouth of the Hoosatonic River, Connecticut. Scaup would pass back and forth over this sea-wall without showing much fear, but they are very loath to cross necks of land or strips of dunes if they can go around.

In England they are taken in some numbers by the old method of punt-shooting and they are considered easy birds to "set" up to. Only very seldom indeed do they figure in the takes of the decoys. Harting (1901) gives but one occurrence which he considers very exceptional. Probably small bags of this species are the rule in European waters, as they are in our own. Stevenson and Southwell (1890) speak of one man killing 120 in one day during a hard frost in Norfolk. W. Thompson (1851) records a shot from a punt in Belfast Bay which accounted for 24 but as a general thing big shots are not easy to make in this way for the ducks string out and swim ahead of the approaching boat.

Scaups have probably always been netted to a certain extent. Montagu (1813) speaks of the practice in England, and Naumann (1896–1905) describes the methods used in Holland and Germany. He says that large-meshed nets are used stretched out horizontally three or four feet below the surface of the water. The ducks get under these while searching for food and in attempting to rise to the surface are caught and drowned. He tells of one place where thousands are caught, especially when the weather is severe and the Scaups have gathered about the mouths of rivers.

Behavior in Captivity. This species is not an especial favorite on ornamental waters and in many large collections is not to be seen. There are several reasons for this. One is the short duration of life in most enclosed ponds, due without doubt to lack of proper animal food. My own specimens as a rule live only about a year and are in fact about the shortest-lived birds that I have kept. Montagu (1813) spoke of one still alive that had been six years in a menagerie in England and Mr. Astley had one that lived at least eight years but such records are wholly exceptional. Of eight specimens in the London Gardens the average life was one year and eight months, while the longest was six years and one month (P. C. Mitchell, 1911). Another reason why Scaups are of less interest than many other ducks is their usual failure to breed in confinement. So far as I know there is not a single instance of a wild-caught bird even going so far as to build a nest or lay an egg. But I was interested to find that a hand-reared female which Hugh Wormald raised in 1922, from eggs imported from Iceland, bred in 1923 at the early age of ten months. This in spite of a general belief that Scaups do not mate and lay eggs until two years old.

They become rather sluggish in disposition under fence and seldom exhibit active courtship. They are easily tamed, a fact noticed by Montagu (1813) and by

W. Thompson (1851) and Lilford (1895). The latter said that he had seen them only a few days after capture following persons around a pond for bread and he noticed how loath they were to take food off the surface, seeming not to notice it there at all.

My Scaup have always moulted later in the summer than all other ducks, in fact, one season I noticed that three males were just beginning to show a change on July 23. Before this time they showed no feather loss with the exception of a ring of feathers around the neck, which seems to be the first region affected.

I used to feed my birds once in a while upon live salt-water minnows (*Fundulus*) and they would gulp down fish several inches long with great relish, rising to the surface with them and going through many vigorous head-shakes before they transferred the fish from a crosswise to a lengthwise position in the bill, preparatory to swallowing.

Hybrids. Crosses between this and other species are rare. Instances have been recorded of crossing with the Tufted Duck, the Red-head (*Nyroca americana*), the White-eyed Duck and the Golden-eye (Poll, 1911). I know of no instances of its having hybridized in confinement.

GEOGRAPHICAL RACES

The geographical forms are poorly marked and it is a question whether any of them is worthy of recognition. The American race, *Nyroca marila nearctica*, is certainly of very doubtful validity. They are as follows:

NYROCA MARILA MARILA (Linné)

Anas marila Linné, Systema Naturæ, ed. 12, vol. 1, p. 196, 1766.
Nyroca marila Fleming, Philosophy of Zool., vol. 2, p. 260, 1822.

Characters: Larger than the eastern form, *N. m. mariloides;* wings of adult males measuring from 220–233 mm.

Range: Europe and northern Asia, but eastern limits not defined.

NYROCA MARILA MARILOIDES (Vigors)

Fuligula mariloides Vigors, Zool. Voyage 'Blossom,' p. 31, 1839.
Fulix mariloides Swinhoe, Proc. Zool. Soc. London, 1873, p. 412.
Aythia affinis mariloides Stejneger, Bull. U.S. Nat. Mus., no. 29, p. 161, 1885.
Fuligula marila Auct. (in part).

Characters: Smaller (with few exceptions); wing of adult males according to Hartert (1920a) 207–220 mm. Also the same writer notices that the black barring of the upper side is coarser thus giving it a darker appearance, which is particularly noticeable on the scapulars.

Range: Bering Island, and probably Kamchatka and elsewhere. In winter, China and Japan (Hartert, 1920a).

NYROCA MARILA NEARCTICA (STEJNEGER)

Aythya marila nearctica Stejneger, Bull. U.S. Nat. Mus., no. 29, p. 161, 1885.
Fuligula marila nearctica Hartert, Kat. Vogelsammlung Mus. Ges. Frankfurt, p. 232, 1891.
Fuligula marila Auct. (in part).

CHARACTERS: There is very little to distinguish this from the true Scaup of Europe and very likely the race should be suppressed. The size is apparently the same as in *N. m. marila*, but the American examples are supposed to have the barring of the upper side as dark as in the eastern form, *N. m. mariloides*, or even darker. In most cases the outer webs of the inner primaries are said to be darker in the American than in the European birds but I must admit that in the few specimens which I have compared the differences were either absent or very slight.

RANGE: North America.

LESSER SCAUP DUCK

NYROCA AFFINIS (EYTON)

(Plates 62, 64)

SYNONYMY

Anas marila Forster (*nec* Linné), Phil. Trans. Roy. Soc. London, vol. 62, p. 413, 1772.

Fuligula marila Bonaparte (in part), Ann. Lyceum Nat. Hist. New York, vol. 2, p. 392, 1826.

Fuligula affinis Eyton, Monograph Anatidæ, p. 157, 1838.

Fuligula minor Bell, Proc. Acad. Nat. Sci. Philadelphia, vol. 1, p. 141, 1842.

Aythya mariloides Bonaparte (in part), Cat. Met. Uccelli Europ., p. 73, 1842.

Anas marila americana Schlegel, Revue Critique, p. cxx, 1844.

Fuligula mariloides G. R. Gray (*nec* Vigors), Genera of Birds, vol. 3, p. 621, 1844.

Fuligula melanocephala Lichtenstein, Nomenclator Avium, p. 102, 1854.

Marila affinis Bonaparte, Comptes Rend. Acad. Sci. Paris, vol. 43, p. 651, 1856; A.O.U. Checklist, Auk, vol. 25, p. 362, 1908.

Fulix affinis Baird, Birds No. Amer., p. 791, 1858.

Anas affinis Giebel, Thesaurus Ornith., vol. 1, p. 343, 1872.

Nyroca affinis A. and E. Newton, Handbook of Jamaica, p. 113, 1881.

Aythya affinis Stejneger, Bull. U.S. Nat. Mus., no. 29, p. 161, 1885.

Fuligula marila, var. *affinis* Dubois, Faun. Vertébr. Belg., Oiseaux, vol. 2, p. 468, 1892.

VERNACULAR NAMES

English: Lesser Scaup Duck, Little Blue-bill, River Blue-bill, Marsh Blue-bill, Mud Blue-bill, River Broad-bill, Creek Broad-bill, Pond Broad-bill, Mud Broad-bill, Fresh-water Broad-bill, Creek Black-head, Little Black-head, Flock Duck, Flocking Fowl, River Shuffler, Cold-shin, Fall Duck.

German: Purpurschillernde, Kleine Moorente.

French: Petit morillon, Fuligule milouinette, Dos gris.

Dutch: Kleine Toppereend.

Spanish: Pato del medio.

DESCRIPTION

ADULT MALE: Plumage almost exactly like that of the Greater Scaup except that in a shaded light the reflections on the feathers of the head and neck are purple instead of green. The black markings on the scapulars are somewhat coarser and broader. The feathers of the sides and flanks are browner and more or less vermiculated. The primaries are more nearly uniform in color, without distinctly pale areas.

Iris chrome yellow. Bill bluish black. Legs and feet greenish lead-color.
Wing 190–201 mm.; bill 40; tarsus 37.
Weight 1 pound, 8 ounces to 1 pound, 14 ounces (0.68 to 0.85 kilograms).

ADULT FEMALE: Like the female of the Greater Scaup (*Nyroca marila*) but smaller and the white face-mark not so great in depth. It is not safe to attempt to distinguish the female of this species except by measurements. Old specimens are blackish about the head. In breeding plumage, that is, in June and July, the white face-patch is usually lost, and there are somewhat fewer vermiculated feathers among the scapulars.

Iris brownish yellow. Bill dark gray. Legs and feet similar to those of male but duller.
Wing 185–198 mm.; bill 36–40; tarsus 35.
Weight 1 pound, 4 ounces to about 1 pound, 10 ounces (0.56 to 0.73 kilograms).

FEMALE IN FIRST (JUVENAL) PLUMAGE: Like adult female but the white face-patch not so clearly defined. Vermiculated scapulars not present at first but these are not always well defined even in adult plumage. Lower abdomen more brownish and streaked than in adults. Tail faded and blunt at the tip.

MALE IN FIRST (JUVENAL) PLUMAGE: Like the female, but the head soon becomes darker, and the white face-patch is obscured. This sex can usually be distinguished in early autumn by the greater amount of vermiculation on the scapulars. (For details of plumage changes see the account of the Greater Scaup.)

MALE IN ECLIPSE: In June the head loses its iridescence and becomes dull brownish to blackish, lighter around the lower neck and forming a distinct collar. Feathers with whitish margins appear among the black feathers of the breast. Later on, the mantle changes from black to a duller brownish color, with fine vermiculations. The flanks also become somewhat grayer and show vermiculated feathers. The scapulars lose the bright white and black appearance and look nearly like the mantle. Later on in the summer white face-spots appear at the base of the culmen and the chin also becomes whitish. The occiput may be black, while the cheeks, throat, and neck have a ragged appearance and are brownish or grayish. The black chest-patch is apparently lost late in the summer and the breast then looks almost the same as in the female. The perfect eclipse phase is not usually seen before late August, and it may persist until the end of September or later.

YOUNG IN DOWN (Plate 62): Very much like the young of the Greater Scaup and probably not to be distinguished except by its smaller size. As in most downy young there is considerable variation in general color, as well as in face-pattern. There is usually a fairly well-marked light streak above the eye but this may be nearly absent or reduced to a mere spot above and in front of the eye. There may or may not be indications of a darker streak behind or through the eye and there is usually a darker patch near the angle of the jaw. The upper side is very dark brown to black, with the wing-, scapular-, and rump-patches very indistinct. The yellow-buff coloring on throat and breast fades out at the age of two or three weeks.

Iris pale olive. Culmen deep olive, nail dull brownish, gular sac pale brownish yellow. Tarsus and toes pale greenish olive, darker at the joints; webs dark olive.

DISTRIBUTION

General

THE Lesser Scaup, a close ally of the Greater Scaup and very frequently confused with it, is a strictly American species, somewhat more southern and more western in its distribution than its relative, and one of our most abundant ducks. With this species more than with any other a careful distinction must be drawn between the breeding range and the summer range, because

in many States of the Union, to say nothing of Mexico or even Central America, specimens of this duck are seen not uncommonly until well into the summer or even throughout the warm season. These birds are, however, non-breeding birds and in most cases there is no evidence of actual nesting.

Breeding Range

In reality the Lesser Scaup has a wider breeding range than its relative. The northwestern limit of the breeding area is eastern Alaska, where nests have been taken at Fort Yukon (Kennicott, *fide* Baird, Brewer and Ridgway, 1884), Circle (Osgood, 1909), Eagle (U.S. Biological Survey) and Lower Lebarge Lake (Bishop, 1900) as well as at Glacier Bay (Grinnell, Bryant and Storer, 1918). Dall and Bannister's (1867) statement that the species is not uncommon and breeds at the mouth of the Yukon must, I believe, rest on error. On migration it seems to be common in autumn along the coast of southeastern Alaska.

Alaska

In northwestern Canada the Lesser Scaup breeds regularly as far north as the Arctic coast and eastward to about 112° west longitude. Stefánsson (1913) found it fairly common on the MacKenzie delta, and saw others farther east in Langton Bay and even in the western part of Coronation Gulf. R. MacFarlane (1908) has recorded nests taken on the Anderson River and Preble (1908) reports having seen many of these birds all through the MacKenzie basin, at Fort Franklin, Great Bear Lake and about Great Slave Lake. Frank Russell (1898) states that it is a common species on the islands in Great Slave Lake, but for some reason he found it rare farther south at Fort Chipewyan. I notice that the maps of the U.S. Biological Survey in Washington extend the breeding range as far east as Aylmer Lake, on what basis I do not know. About the west end of Lake Athabasca and on the Athabasca delta Mr. Harper (MS.), while collecting for me, found the Scaup the most abundant breeding duck.

Northwest Canada

In British Columbia, so Major Allan Brooks tells me, the Lesser Scaup breeds commonly north of about latitude 51° (scarce at Clinton), north to the extreme northern border at Atlin. In 1903, the same authority wrote that it was an abundant breeder in the Cariboo district, and in a recent paper (1920) he speaks of it as abundant in central British Columbia also, that is, between Lake La Hache and Lake Quesnelle, though it is a rare nesting bird in the south.

British Columbia

The Lesser Scaup breeds in all the central and northern parts of Alberta. Stansell (1909), to be sure, says it does not nest in central Alberta, but specimens have been taken at Edmonton and the species was seen at various points along the Athabasca basin (Preble, 1908) while Dippie (*fide* J. and J. M. Macoun, 1909) took nests at Burnt Lake, and W. S. Brooks and Cobb (1911) found it breeding in east-central Alberta. Mr. Wolfe writes me from Edmonton that on the near-by lakes where he collects eggs for propagating purposes this Scaup is an extremely abundant nester. He thinks he could gather a bushel of eggs in a few hours. On the other hand the Greater Scaup he considers a rare breeder in this region.

Alberta

It is a common nesting bird in southwestern Saskatchewan at Crane and Hay Lakes (Bent, 1907) and at Prince Albert and Quill Lake in the central part of the province. Nests have also been taken at Indian Head and Cypress Lake (Spreadborough, in J. and J. M. Macoun, 1909).

Saskatchewan

In Manitoba it is no longer an abundant breeder, though still generally distributed (E. E. Thompson, 1891; Dippie, in J. and J. M. Macoun, 1909; Taverner, 1919). Preble (1902) is probably correct in assigning various records for the Nelson River, Severn River, Severn House, Fort Churchill and York Factory to the Greater Scaup, which is the more eastern species.

Manitoba

There are eastern breeding records of the present species for Canada: Dunnville (McIlwraith, 1894) and Nipissing, Ontario (Hubel, 1907), which are, I believe, open to doubt. Schmitt's (1904) statement that a few nest in Anticosti cannot be accepted without further evidence, and Downs's (1888) record of nesting at Grand Lake, Nova Scotia, is probably to be referred to the

Eastern Canada

MAP 89. Distribution of Lesser Scaup Duck (*Nyroca affinis*)

Breeding range, dotted line; winter range, broken line

Greater Scaup. The present species is said to have been once taken, in September, at Adies Pond, Newfoundland (Porter, 1900) and a few times in Greenland at Egedesminde, in June, and at Julianehaab (Winge, *fide* Schalow, 1905). It is, of course, impossible to say now whether these were really Lesser Scaup or not.

Newfoundland

Greenland

Most breeding records for the United States are sporadic. Three different observers have reported females and young seen in the vicinity of San Francisco (Squires, 1915; Maillard, 1915; Schussler, 1916) and Wetmore (1921) found one solitary pair actually breeding on the Bear River marshes, Utah. A few have been reported nesting in the Barr Lake chain, Colorado (L. J. Hersey and Rockwell, 1909; Felger, 1909), but Mr. Rockwell writes me that his Lesser Scaup may have been merely summering birds and not breeders. The U.S. Biological Survey lists two localities in Wyoming: Lake Eleanor in the northwest and Gillette in the east, where it has been proved to breed. In northern Montana it is somewhat more common as a breeder, at least east of the Continental Divide (A. A. Saunders, 1921), and there are several localities in northeastern North Dakota where it nests quite regularly (Job, 1899; Bent, 1901–02). It is known to breed in a few localities in Minnesota (U.S. Biological Survey; Roberts, 1919), and has done so at Spirit Lake and Clear Lake, northern Iowa (Cooke, 1906; R. M. Anderson, 1907) as well as at Delavan and Lake Koshkonong, southern Wisconsin (Kumlien and Hollister, 1903; Cooke, 1906). The easternmost records are for St. Clair Flats, Michigan (Saunders, in J. and J. M. Macoun, 1909), Kewanna and English Lake in northern Indiana (A. W. Butler, 1898; Cooke, 1906) and northwestern Ohio (W. L. Dawson, 1903; L. Jones, 1903; Henninger, 1910). Crippled birds very probably nest in regions far beyond the regular range. Thus, on July 13, 1910, a pair accompanied by seven young are reported to have been seen on Currituck Sound (White, Field and Stream, August 6, 1910) and a female with nest and eight eggs was taken in 1896 at Lake Jackson, Leon County, Florida (R. W. Williams, 1907). There are late spring records of non-breeding birds even as far south as the Gulf coast of Texas (A. R. Cahn, 1922) and more or less unsatisfactory reports of breeding come from Louisiana. They are almost common on the Gulf coast of Florida up to July (Pennock, MS.).

United States

Winter Range

The winter quarters of the Lesser Scaup are, on the whole, more southern than those of the Greater. On the Pacific coast some are found in the cold season as far north as Admiralty Island, Alaska (Bailey, MS.), Okanagan, British Columbia (A. Brooks, *fide* Kermode, 1904), while in Washington it is fairly common about Tacoma (W. L. Dawson and Bowles, 1909), Puget Sound (Rathbun, 1915) and in Okanogan County (W. L. Dawson, 1897). Woodcock (1902) says it is not uncommon in Oregon, where, at Netarts Bay, Jewett (1914) found it abundant. In California it is found throughout the State (Grinnell, Bryant and Storer, 1918). It is much more of an inland species in the winter than its relative, and has been known to winter on Pyramid Lake, Nevada (Hoffman, 1881), as well as on the San Pedro River, Arizona (Scott, 1886). A few also pass the winter in Colorado (Felger, 1909). In western Texas, W. Lloyd (1887) found it fairly abundant, and Lacey (1911) describes it as not uncommon about Kerrville. On the Texan coast it is, in places, very abundant, from Fort Brown (J. C. Merrill, 1878) northward, especially at Corpus Christi (Sennett, 1879; Beckham, 1888) and in Refugio County (Carroll, 1900).

Pacific Coast

Interior

Texas

On the Louisiana and Mississippi coast and in the Delta it is also abundant (McIlhenney, 1897; Beyer, Allison and Kopman, 1907; and others), whence the winter range extends north in the Mississippi Valley. Moderate numbers winter in Arkansas (Howell, 1911) and rarely it is found even in Illinois (Cooke, 1906) and Iowa (R. M. Anderson, 1907). In the winter of 1908–09 considerable numbers passed the cold months as far north as Wayne County, Michigan (Wood, 1910).

Mississippi Valley

On the Atlantic coast its main wintering area only begins where that of the Greater Scaup ends.

Nevertheless, a few winter, at least up to January, as far north as the central New York lakes and near Detroit (Eaton, 1910; Eddy and Easton, 1917; and others) and southern New England (G. M. Allen, 1909; *et al.*). In New Jersey it is somewhat more common (W. Stone, 1909) and a few are said to winter in Pennsylvania also (B. H. Warren, 1890). In Delaware (Rhoads and Pennock, 1905) and in Maryland (Kirkwood, 1895) it is fairly abundant, and the same is true of Virginia (Rives, 1890; Smyth, 1912). With North Carolina its center of abundance may be said to begin (T. G. Pearson, C. S. and H. H. Brimley, 1919). Thence southward through South Carolina (Wayne, 1910), Georgia, and the whole of Florida (F. M. Chapman, 1888; Scott, 1892; Cory, 1896; R. W. Williams, 1904; Pangburn, 1919; etc.) it is one of the commonest ducks, in fact in many regions by far the commonest.

Atlantic Coast

The range also includes many of the islands, namely, the Bahamas (Bonhote, 1903; Riley, 1905) and to a less extent Cuba (Gundlach, 1875; V. J. Rodríguez, 1917), Jamaica (March, 1864), Porto Rico (Gundlach, 1874; Wetmore, 1916), St. Thomas, St. Croix, Virgin Gorda, Dominica, Santa Lucia, Tobago and Trinidad (U.S. Biological Survey; Cooke, 1906; F. M. Chapman, 1894).

Bahamas Antilles

In Mexico the Lesser Scaup probably winters everywhere in suitable localities. In Lower California it has been found at San Raimundo, Magdalena Bay, and San José (Brewster, 1902; U.S. Biological Survey), and at other places in the Gulf of California, and in Mexico proper at Mazatlan and San Blas (G. N. Lawrence, 1874; H. H. Bailey, 1906), Zacatecas (Richardson, British Museum), Orizaba (Sumichrast, 1881), Puebla (Ferrari-Perez, 1886) and commonly at Lake Chapala (Beebe, 1905). G. N. Lawrence (1869) has recorded it from Progreso, Yucatan, and von Frantzius met with it at San Antonio, Costa Rica (G. N. Lawrence, 1868–69). Salvin found it quite common on Lake Dueñas and saw others at Lake Atitlan, Guatemala (P. L. Sclater and Salvin, 1859, 1876). In Panama it is abundant on Gatun Lake (Jewel, 1913; W. Stone, 1918) and has been taken also at Castillo and Veraguas (Salvin, 1870). Recently a specimen has been recorded from La Carolina, Ecuador (Lönnberg and Rendahl, 1922).

Mexico

Central America

Ecuador

A specimen of this species is recorded as having been taken at Katwyk, South Holland, on December 21, 1859 (Koller, 1888) but I cannot help thinking that this was merely an abnormally small example of the Greater Scaup.

Europe

Migration

There is nothing particularly characteristic about the migration of this species, at least so far as we know at the present time. The regular migration range, of course, includes most of the United States, especially the interior, for this species is much more of an inland bird than its relative. At a good many inland points they seem to be much commoner in the spring than in the autumn. For instance, at the Kennicott Gun Club in eastern Colorado during thirteen years' shooting, 63% of the total bag was made in the spring, and only 37% in the autumn, in spite of a longer shooting season (Bergtold, 1924).

Like most far-northern breeding ducks, it is rather late in departing in the spring. The great majority leave the wintering grounds in March and pass over the United States during the same month, reaching southern Canada in April and the far-northern breeding areas in May. In the autumn they stay north until the waters freeze. They pass over the United States during October and reach the wintering grounds late in the same month or early in November. Their autumn appearance in New England is more regular, I think, than that of any other duck; that is, they may be looked for with certainty between the 8th and 12th of October. The spring migration probably follows the inland water-ways more closely than the autumn flight. This seems to be true of the Atlantic as well as the Pacific coast. North and east of New England the Little Blue-bill is only a very rare autumn migrant, apparently absent in the regions about the Gulf of St. Lawrence.

As with some other diving ducks many persons have noticed a disproportionate number of male birds, in some places as great a discrepancy as 95% to 5%, but I do not know whether the sex distribution could be worked out for latitudes. We need a lot more detailed observation on the proportions of the sexes at different stations in winter.

Banded Specimens

Of 32 Lesser Scaup banded at Avery Isle, Louisiana, on February 4, 1916, only two have been recovered: one in autumn, 1918, at Bee Creek, Illinois River, Illinois, the other on May 26, 1919, at Fort Smith, Northwest Territory, Canada (U.S. Biological Survey).

GENERAL HABITS

A clear picture of the status, movements and range of this duck is more difficult than one would suppose in a species so common. Of course this is due to constant confusion with the Greater Scaup, and a partial confusion with the Ring-necked Duck. The older writers, Audubon and Wilson, failed to recognize this as a true species, although they both noticed a great range of variation in the weights and sizes of Scaups. Wilson hit rather near the mark when he noticed that those which frequented the seashore were "much the fattest," for these no doubt were mostly of the larger species.

The Lesser Scaup was differentiated by Eyton in 1838 and Giraud (1844) was the first popular American writer who noticed it. As far back as his time it was already recognized by the gunners of Long Island and went by the name of Creek Broad-bill to distinguish it from the Greater Scaup, or Bay Broad-bill. There is little doubt that most of Audubon's account of the Scaup refers to the present species, as his plate certainly does.

It is difficult and often impossible to discriminate between this and the Greater Scaup in the field. Adult males may be recognized comparatively easily, but with females and young the case is very different. With such individuals the observer must have the bird in his hand and must carefully measure the wing and bill. Even if this precaution is taken there will be an occasional specimen which will give some trouble for the extreme measurements do actually overlap; that is, a very small immature Greater Scaup may be about the same size as a very large female or immature Lesser Scaup. Thus specimens with poorly developed plumage and with a wing measurement of around 200 mm. give the impression of real intergrades. In fact several writers have thought that hybrids between the two Scaups were of common occurrence. But it seems to me we have little evidence that such crossings are anything but very rare. If we knew in detail the physiology and anatomy of these two species of ducks it seems quite likely that some fundamental differences could be demonstrated. Until that time we must be content to describe the ranges and the life-histories. Certainly the general habits are similar, but the distribution, both summer and winter, the direction and time of migration, and the winter dispersal

of the Little Blue-bill have very little in common with those of the Greater. Perhaps after all the resemblance of the Lesser to the Greater Scaup is merely another case of the parallelism so common in the animal kingdom and by no means absent among the ducks.

The Lesser Scaup probably numerically exceeds its neighbor, the Greater Scaup, more than 15 or 20 to one in North America. It seems to fill the same niche here that the Tufted Duck does in Europe, but the two do not appear to be very closely related. This is a duck which frequents both fresh and salt water, preferring inland or sheltered waters that are fresh or brackish. Being perfectly at home in smaller lakes, rivers, and even in many marshes, it is much more evenly distributed than its larger cousin. It migrates earlier and winters for the most part south of the Common Scaup, but where the winter ranges of the two overlap they will be found in rather different situations. The association between the two species is usually of an accidental nature and there cannot be said to be any close tie between them, judging by the composition of most flocks.

Wariness. This is not a wary bird in any sense of the word. It flies low, decoys easily and only becomes well educated where it is assembled in great "rafts" or is subject to constant persecution. These are among the most curious of ducks. Hundreds of times I have seen them swim up to within a half-dozen yards of a sand beach just to look over the live Mallard decoys that were playing about in the shallow water. They had nothing in common with the Mallards and there was no suitable feed for them, still the attraction seemed irresistible in nine cases out of ten. Their disposition is as different from that of the Golden-eye, which almost never allows his curiosity to get the better of him, as it possibly can be. They are said to be easily decoyed by means of a red flag or with a dog and they are apt to swim toward a concealed person, apparently attracted merely by the sound of crackling reeds and grass (F. Harper, MS.); but this, of course, only where they are seldom disturbed. The little flocks that first arrive in Massachusetts waters in mid-October are often very tame and extremely sociable. They can sometimes be "boated" to within shot in an open canoe and can nearly always be sculled to in a well-concealed duck-boat. They tend to swim a good distance away from the boat before they take wing, stringing out in a line and offering a poor shot. They follow a moving bunch of wooden decoys even more readily than the Greater Scaup and thus allow themselves to be enticed much nearer the shore than is good for them.

These ducks become extremely tame where they are protected. This may be seen in many of our own New England ponds and inner harbors, but most notably on Lake Worth in Florida, and Lake Merritt in Oakland, California. In such places they are just like domestic ducks as far as feeding from the hand is concerned.

Daily Movements. These ducks do not differ in great measure from the Greater Scaups in their feeding and flighting periods except that as a rule their habitat makes them much more independent of the tide. They feed freely at night, a fact attested to by various observers; still I should call them day-feeders in the main. Like other ducks they are far less active through the noon hours. I have always noticed that these Scaups while in full migration seldom appear on our Massachusetts ponds early in the morning. Quite regularly they arrive between eight and ten o'clock, very different from the main flights of surface-feeders. I suspect that this is true of other diving ducks on migration and may be accounted for by the fact that the first hours of daylight are taken up in feeding.

Gait, Swimming, Diving. The gait is exactly the same clumsy rolling walk as in the Greater Scaup. They swim as a rule rather low, the tail just above the water or dragging, and the head drawn well down. On the breeding grounds F. Harper (MS.) noticed that the females carried their necks extended and heads elevated whereas the males had the typical drawn-in "low-browed" appearance. I have never noticed this on the wintering grounds and think that it is undoubtedly part of the very simple courtship performance.

It is not uncommon to see Lesser Scaups dabbling about in shallow water, although I have never seen them really feeding by tipping. Often they turn way over on one side, sometimes almost on their backs to arrange the feathers on the flanks or under parts. They are rather slow swimmers. Seldom do they come out of the water during the autumn or winter, but on the breeding grounds they do so often. Harper writes that he saw them resting or standing on a log or crawling out upon a muskrat house, shaking their tails vigorously from side to side as if to cast off any remaining drops of water.

They do not care to feed in particularly deep water, perhaps three to eight feet is about right for them, and when thus engaged they stay under from 20 to 25 seconds, the periods on the surface being much shorter, not more than one-third to one-half as long. I have no notes upon the maximum length of time under water, but doubt if it is much over 35 seconds. Some observed at Orlando, Florida, stayed under as long as 33 seconds with an above-water period of 10 to 12 seconds (U.S. Biological Survey field catalogue).

At the start of a dive they usually leap forward, almost out of water, with the wings closed and the tail somewhat spread out.

When swimming up to decoys they are very apt to pack densely together, offering easy shots to the "stand" shooter. When diving, of course, they scatter out much more, each member of a flock swimming along while he is on the surface. When they have located a rich harvest, they all stop for a time and dive in an irregular and greatly scattered formation.

Flight. There is nothing especially characteristic about the Little Scaup on the wing. They travel about a great deal, flying close to the water in irregular scattered flocks but when high up they assume more regular formations, like other diving ducks. The wings make only a rustling or low whistling sound.

Sociably inclined as it is, this little duck gathers in immense flocks on its wintering grounds. As we see them in New England on their autumn migration they appear in small flocks of eight to a dozen, while single stragglers, young birds of the year, are common.

Association with other Species. Although so extremely gregarious, Lesser Scaup do not seem to mix very freely with other ducks. Sometimes little flocks of this species appear on our New England waters with one or two Red-heads among them. Sometimes, though rarely, there will be an occasional Greater Scaup with them. In certain regions they are found associated with Canvas-backs (San Pablo Bay, California) and at Currituck Sound, North Carolina, they feed on much the same waters as the Canvas-back, Red-head and Ruddy, although there is no real mixing of the flocks.

On the nesting grounds their eggs are now and then laid in the nest of the Red-head, but this is not a common occurrence (A. Wolfe, *in litt.*). They also occasionally lay with the Gadwall, White-winged Scoter, Widgeon, Shoveller, and very likely with other ducks, but their own clutches are always unmixed (Job, 1899; Bent, 1901–02; Ferry, 1910). The only exception to this latter statement is the case of a nest found by Harper (MS.) which contained seven eggs of the Lesser Scaup and one of the Ruddy Duck.

Voice. I have never heard any note from the male and it is usually considered an absolutely silent bird. However, Major Brooks tells me he has heard a low "cooing" note during display, comparable to the extremely low cooing voice of the male Greater Scaup. Wetmore (1920) seems to be the only observer who has recorded any other sound from the male, and he describes it as a low whistle! Probably these sounds carry only a few yards and they must tax the sharpest ear.

The female has a voice similar to that of the Greater Scaup, if not quite the same. She, in contrast to the male, is noisy, and her note is often heard and well imitated by the shore gunners of our Atlantic coast. It may be likened to the syllables *kerr-urr*, or *hurrr*.

Food. As with the Greater Scaup, animal food comprises a great part of the diet of this species. In winter this consists of large numbers of mollusks, both fresh- and salt-water species, and, in the more southern regions, insects, dragon-fly larvæ and water-beetles. The favorite vegetable food is the seed of widgeon-grass and other

water-plants. They sometimes feed in very shallow water merely by immersing the head (Wetmore, MS.).

In summer, stomachs collected at the Athabasca delta were found to contain from 55 to 99% animal matter. This consisted chiefly of the larvæ of midges (*Chironomidæ*), water-boatmen (*Corixidæ*), caddis larvæ (*Trichoptera*) and dragon-fly larvæ. There were moderate amounts of the seeds of bur-reeds (*Sparganium multipedunculatum*), milfoil (*Myriophyllum spicatum*) and rushes (*Scirpus*).

Downy young collected by Mr. Francis Harper on Lake Athabasca, in 1920, contained from 97 to 98% animal matter. The preponderant items were diving water-beetles (*Dytiscidæ*), larvæ of dragon-flies, water-mites and water-striders. A few seeds of bur-reeds and sedges (*Carex*) were also intermixed.

In an interesting note Dr. Wetmore (1917a) states that on the Bear River marshes, Utah, these birds in October were found crammed with brine shrimp (*Artemia*) and the larvæ of alkali flies (*Ephydra*).

The Lesser Scaup sometimes feeds in sandy-bottomed waters which seem almost devoid of food. Why they should remain in these places where they lose flesh and become little more than living skeletons, is difficult to explain. During a freeze in Florida which killed great numbers of small fish in the Banana River, Cory (1895) found several of these ducks dead, evidently choked by fishes which they had attempted to swallow.

Courtship and Nesting. The Little Scaup pairs rather late in the spring like many others of the group and those who have seen them at this time say that there is nothing very active or striking in the behavior of the males. The display seems to be exactly as it is in the Greater Scaup. Wetmore (1920) at Lake Burford, New Mexico, and F. Harper (MS.) at the Athabasca delta have made detailed studies of it. On May 5, 1920, the first of these ducks were seen on the Athabasca, males preponderating, but there was scarcely any evidence of display. By May 11 they were very abundant, mostly in pairs, but still there was no courtship. During the next few days, however, the males were seen opening and jerking the bill upward, with no audible sound, or drawing the head down close upon the chest with the crown feathers greatly depressed, giving the head a curious flattened appearance. A little later pursuit flights were observed (June 17) and on June 9 the first nest was found. As a matter of fact both Wetmore and Harper have shown that the female takes a very active part in the display, swimming about with extended neck and head, jerking up her bill and uttering her *scaup-scaup* call. The birds during courtship are constantly diving, the female appearing to elude or entice the males who sometimes lose her when she comes up in a concealed spot. Pairs stay very closely together on the water, often touching, and rival males make frequent drives at each other with open bills. The only note which the male utters is a very low "coo" or whistle.

Wetmore (1920) is of the opinion that copulation may take place under water, a point of some interest that would bear further observation among the diving ducks as a whole.

Major Brooks has called my attention to a lump, the size of a hickory nut, which appears and travels *upward*, disappearing before it reaches the throat. There seems to be some sort of throat inflation in the display of nearly all our common diving ducks.

The majority of the breeding dates are late, certainly later than those of the Canvas-back, Red-head or Ring-necked Duck. Nests in late May or early June are exceptional in most parts of the range, while June 15 to mid-July is the chief laying period. May 28 seems to be the earliest date recorded, and there is one other May date (Job, 1899; Bent, 1901–02, 1907; J. and J. M. Macoun, 1909; Ferry, 1910; A. Wolfe, *in litt.*; Harper, MS.).

In favorite localities many individuals nest in close proximity to each other, so as almost to form a colony. Islands in lakes and the grassy edges of lakes are the locations they prefer. The situations chosen are very different from those usually selected by the Red-head, Canvas-back and Ruddy. The nests are nearly all placed on dry ground, usually less, and never more than fifty yards from the water (Bent, 1901–02). Occasionally nests are found on dry tussocks surrounded by water (Baird, Brewer and Ridgway, 1884), and Harper (MS.) found two or three nests on floating bogs among cat-tail and sedge, only a few inches above the surface of the water and close to the edge of it. In the short prairie-grass the nests are often poorly concealed, and at some little distance from the water.

The nest itself is very unpretentious, consisting only of a hollow scooped in the ground lined with a little sedge or grass and, late in the laying period, with an abundant supply of dark, almost black down, and an occasional light feather.

Judging from the size of the clutch alone this species is a very prolific one. Nests with nine to fifteen eggs are not uncommon, and the average, in some places at least, is ten, in other places about nine. Very few nests are found with so few as six or seven eggs, so that in respect to the size of the clutch this species differs considerably from the Greater Scaup.

Mr. A. Wolfe (*in litt.*) has found Lesser Scaups laying in a Red-head's nest and he once found an extraordinary pile of twenty-six Little Scaup eggs, the work no doubt of several females. He took some of these eggs and tried to hatch them, but they did not develop well. Piles of eggs like this are occasionally found deposited by other species of ducks and it would be interesting to know whether they are apt to be infertile.

Their habit of laying eggs in the nests of other ducks has already been mentioned under Association.

The eggs are similar in color to those of the Greater Scaup, being pale grayish with

a tinge of buff, to a rich olive buff. In size they are smaller, measuring 53.3–60.0 mm. in length and 39.0–42.0 mm. in breadth, the average being 57.5 by 40.5 mm. (Bent, 1901–02).

Mr. Wolfe, who has reared many of these ducks from eggs gathered in the wild, writes me that they hatch in twenty-two to twenty-three days.

The young dive readily within forty-eight hours after hatching, although, of course, as with other young ducks, most of the food is at first found on the surface.

The laying season extends over a long period. Harper (MS.) saw males still pursuing the females as late as July 9. By July 6 many, if not most of the males, showed the beginning of an eclipse plumage by their dark-colored flanks. The earliest indications of change, a light-brownish ring about the neck, were indicated in a few males as early as June 17. The males desert the females at the beginning of incubation and then gather in small flocks. After the 10th of July flocks of adults of from five to twenty birds were commonly seen. Before that date the birds were always in pairs. Mr. Allan Brooks found that in northern British Columbia the males stayed about near the nesting grounds until they were well along in eclipse but most, if not all, vanished by the 22d of July. He did not see any that were flightless.

Status. Why a common species and one not popular for the table should have suffered any great reduction is rather a puzzle. But such has undoubtedly been the case on the Atlantic coast all the way from New England to Florida. Although still one of the most abundant ducks it has probably shown a decrease of 50 or 60 per cent in the past thirty or forty years. Evidence of any recovery is only recent, and it has not responded to the increased protection of the past ten years as rapidly as other species: Mallard, Pintail and Black Duck, for instance. In estimating the comparative status of this duck we come upon several difficulties. Ducking clubs do not shoot them if better ducks are to be had, and when they do they are lumped on the score-books with the Greater Scaup. If a club shoots on a marsh or in shallow ponds, few Greater Scaup will be killed, but this does not mean that the larger species may not be numerous in some neighboring sheet of water better adapted to them. Most of the Scaups shot in the Lake Erie marshes are of the Lesser sort, and they are numerous there both spring and autumn. In fact this is much the commonest of the diving ducks there in the spring. The club scores do not point to any special decrease, but for various reasons one cannot place much reliance upon figures for this species. At Wenham, Massachusetts, my autumn records point to a decided decrease since I began to shoot there in 1899. Here they represent 15 per cent of all ducks shot, taking a twenty-year period average, and they are the second species in abundance, only exceeded by the Black Duck. On Martha's Vineyard island they are abundant, but not increasing.

During their flight along our eastern-coast ponds they do not tarry very long in

most places. They become much more numerous farther south, abounding in suitable waters on the Long Island, New Jersey, and Delaware shores, but most of these birds pass on. They are really abundant during winter in upper Chesapeake waters and even more so in the brackish sounds of North Carolina. Here one can see them in their thousands and they used to comprise a large proportion of the bags of market shooters, especially when Canvas-back, Red-head and Ruddies were scarce. In South Carolina (Winyah Bay) it is said not to be nearly as plentiful as it used to be.

One of the greatest haunts of this duck is eastern Florida, both in the interior lakes and along the coastal sounds and rivers. F. Harper (U.S. Biological Survey MS.) estimated a few years ago that there were 200,000 to 300,000 wintering on the so-called Indian River; 40,000 to 50,000 on Lake Okeechobee; and 20,000 to 25,000 on the lakes in the eastern half of the State north of Okeechobee. This estimate is probably very conservative, but as mentioned above, this Scaup has certainly been greatly reduced in Florida as a whole. Whether this is merely a case of over-shooting plus the disturbing influence of motor-boats I do not know, but this seems likely enough. Forbush (1912) thought that the destruction took place between 1878 and 1900. The record books of the Canaveral Club at Cape Canaveral do not suggest any recent increase of Little Blue-bills, although other ducks have increased there since Federal protection began.

The brackish or enclosed waters of the Gulf Coast are also the home of innumerable Little Blue-bills. The report of the Louisiana Game Commissioner showed that 38,560 Blue-bills (probably at least 95 per cent of this species) were marketed during the winter of 1913–14, representing 13 per cent of all ducks. It is probable, however, that there was a good deal of confusion with the Ring-necked Ducks which were said to number 13,632 on the same list. The Lesser Scaup is also a very common duck in California, and the diminution there has not been especially marked (Grinnell, Bryant and Storer, 1918). Nevertheless these writers admit that the older hunters say that the numbers are not nearly so great now as formerly. They are not recorded satisfactorily in the reports of the various Game Transfer Companies for that State so that it is hard to assign a place to them in comparison with other ducks.

The enormous numbers which nest in certain localities have been mentioned in other places. Mr. A. Wolfe writes me that near Edmonton, Alberta, where he collects eggs for hatching purposes, it would be easy to pick up a bushel basketful in a few hours. In the Athabasca delta it was easily the commonest breeding duck, ranking well ahead of the Mallard, Golden-eye and Pintail. In Wisconsin, at Delavan, from 1892 to 1899, Hollister (1920) found that the Lesser Scaup was the commonest migrant duck, more so in spring than autumn, and represented 15.6 per cent of all ducks shot, as against 1.71 per cent for the Greater Scaup.

Enemies. No doubt the Common Crow is by far the worst factor in the de-

struction of eggs, especially in Alberta and Saskatchewan. Forbush (1912) described a lynx attempting a stalk on a flock of these ducks in Florida. Major Allan Brooks found that on the east coast of that State the Bald Eagle regularly fed upon them and a good many must be taken by this bird wherever it is plentiful.

Damage. I know of no damage to food crops of man, including shell-fish. Very few edible mollusks appear to be taken.

Food Value. Taken as a whole this is one of the poorest ducks for the table. Nevertheless one may occasionally get young birds in October that are fat and not at all "strong." Those from Currituck Sound might be considered fair, but the Florida ones are very rank indeed, and the longer they stay there the poorer they seem to become; poor in flavor and lean in flesh. On the Pacific coast they are in no better favor and their price, $1.00 to $2.00 a dozen in the San Francisco markets, gives an idea of the low esteem in which they were formerly held. In the Boston markets they used to fetch a good deal more than that, from 30 to 40 cents a pair, but that was when good ducks were bringing from $1.75 to $6.00 a pair. Audubon, whose account of the Scaup fits the Little Blue-bill the best, thought them very poor food, but there are not wanting some to give them praise. Elliot (1898), G. B. Grinnell (1901) and one or two others consider them "very delicate," "tender," or of "good flavor," so it is never safe to generalize.

Hunt. The methods of taking the Lesser Scaup are just the same here on the Atlantic coast as are used for the Red-head, Canvas-backs or Greater Scaup. When they first appear the young birds of the year are very tame; indeed, almost as foolish, sometimes, as Ruddy Ducks or Scoters. I have driven them about and shot them from open canoes and have seen a flock "stool" to a bunch of jet-black Scoter decoys anchored within easy range of a good-sized boat well off shore in salt water. Let nobody think, however, that the ducks on their winter quarters behave in this fashion.

Little Blue-bills being sociable fowl, decoy readily, coming up prettily to the wooden counterfeits and offering beautiful shots. Their bump of curiosity often results in their untimely end. They will swim up to live Mallard decoys, sometimes respond to a partly concealed flag or even try to investigate a mysterious noise. They are not very likely to take alarm at a gun-shot, except at close range, until their education has come on apace. I have even seen them refuse to fly after part of their number was shot. Often, too, when shot at close range on the water, they first try to escape by diving, coming up in a few seconds and taking to wing. It goes without saying that they are tough little ducks to knock down and very hard to pick up when wounded.

Behavior in Captivity. Although I think this Scaup gets along rather better in confinement than its larger cousin, the Common Scaup, it is seldom kept in a pinioned state. The few I have had, have lived only a year or two, showed little activity, and a reluctance to go into eclipse plumage. So far as I know nobody has ever bred them in this country and they do not as a rule go beyond the initial stages of courtship. They require, of course, a varied animal diet, and in some places they might be kept in a healthy state for several years. They have only recently been imported alive to European collections. In December, 1923, Mr. Hugh Wormald received four hand-reared birds of the year. He was rather surprised to find that these birds nested at the age of one year (or rather at ten or eleven months), the first egg being laid on May 26, 1924. I saw the young from a set of eggs which hatched on July 2, having been incubated between twenty-five and twenty-six days.

Out of five adults received at the National Zoölogical Park in Washington in late May, 1917, three died in 1922 and the two others were in good health in September of that year. This is, I think, a fairly good record for wild-caught birds.

Hybrids. Wild hybrids with the Canvas-back and with the Red-head have been recorded (Poll, 1911). Hybrids with the Greater Scaup would be difficult, if not impossible to distinguish unless in full male plumage. There is little evidence that they ever occur.

STEAMER DUCK

TACHYERES CINEREUS (GMELIN)

(Plate 65)

SYNONYMY

Anas cinerea Gmelin, Linné's Systema Naturæ, ed. 13, vol. 1, pt. 2, p. 506, 1789.
Anas brachyptera Latham, Index Ornith., vol. 2, p. 834, 1790.
Anser cinereus Bonnaterre, Encyclop. Méthodique, vol. 1, p. 112, 1790.
Anser brachypterus Vieillot, Nouveau Dictionnaire des Sci. Nat., vol. 23, p. 344, 1818.
Oidemia patachonica King, Zool. Journ., vol. 4, p. 100, 1828.
Micropterus patachonicus King, Proc. Zool. Soc. London, p. 15, 1830.
Micropterus brachypterus King, Proc. Zool. Soc. London, p. 15, 1830.
Micropterus cinereus G. R. Gray, List Genera Birds, p. 74, 1840.
Anas pteneros Forster, Descriptiones Animalium, p. 338, 1844.
Fuligula cinerea Schlegel, Dierent., p. 274, fig., 1864.
Camptolaimus cinereus G. R. Gray, Hand-list, vol. 3, p. 88, 1871.
Tachyeres brachypterus Owen, Trans. Zool. Soc. London, vol. 9, p. 254, 1875.
Tachyeres cinereus Sclater and Salvin, Proc. Zool. Soc. London, p. 402, 1876.
Micropterus macropterus Giglioli, Viaggio MAGENTA, p. 934, 1876.

VERNACULAR NAMES

English: Steamer Duck, Racehorse (Duck), Loggerhead (Duck), Sea-horse, Canvas-back.
German: Patagonische Riesenente.
French: Canard à vapeur, Oie de plein.
Spanish: Pato vapor, Quetar, Quaitar, Quetro, Quetru.
Fuegians: Alakuch (non-volant form), Tachka (volant form).

DESCRIPTION

SUCH is the confusion and uncertainty as to the possibility of more than one species of Steamer Duck that I shall here describe the two main types of plumage and reserve for the text a discussion of the whole subject. I regard the question of two races as yet unsolved but think we may go so far as to say that the findings cannot all be explained on the basis of one natural species.

ADULT MALE (gray phase, *Tachyeres cinereus?*): Head light ashy gray, darker on the crown and fading to pure white on the neck and throat. Mantle, scapulars, back, rump and upper tail-coverts uniform slate gray, without darker or wine-colored edges to the feathers; tail gray like the rest. Breast, sides and flanks the same color as the upper side; abdomen and under tail-coverts pure white. Wing with a moderate carpal spur, slate gray like the back except for a conspicuous white speculum formed by the tips of the greater coverts and all the outer secondaries.

Iris brown. Bill bright yellow, coarse and carunculated at base. Legs and feet yellow.

Wing 252–283 mm., average 267; bill 55–66, average 60; tarsus 66–79, average 73. These measurements are based on seventeen carefully sexed and obviously old males from London Island, Ancud, Chile, and the Straits of Magellan.

Weight 10 to 12 pounds and probably to 14 pounds (Coppinger) (4.53 to 5.44 or 6.35 kilograms). The great weights attributed to this species by the older voyagers (up to 22 pounds) are patent exaggerations.

Adult Female (gray phase, *Tachyeres cinereus*): Size somewhat smaller; color same as in male; wing with carpal spur same as in male.

Iris brown. Bill yellow or yellowish but not such a clear or brilliant yellow as in the male. Legs and feet yellow.

Wing 245–270 mm., average 257; bill 55–63, average 59; tarsus 65–72, average 68. These measurements based on ten carefully sexed old females from Chiloe Island and Ancud, west coast of Chile.

Immature or Juvenal Plumage, Male and Female: We know that there are individuals which do not pass through any red or reddish-tinted phase. Whether these are exclusively the young of the gray phase (*Tachyeres cinereus*) we do not know. A specimen in juvenal plumage from Cape Horn with the primaries not yet fully developed (Museum of Comparative Zoölogy, No. 3318) is gray all over the upper side and without the prominent wine-colored edges to the feathers on the breast, sides and flanks. Abdomen white as in the adult; whole head and neck gray with some rust color on the cheeks and lower side of neck, but not nearly so dark or so ruddy as in most examples of the red phase (*Tachyeres patachonicus*). In other words, this young bird does not look as though he were going to pass through the extreme dark and ruddy phase to be described below.

Bill probably dark greenish on the culmen and lighter below. Legs and feet yellow.

Wing not yet developed; bill 47 mm.; tarsus 63 (rather large for the red type).

Adult Male and Female (red phase, *Tachyeres patachonicus?*): Many of these birds (I have studied some forty-three specimens) do not suggest youth. They are mostly uniform in coloring, with adult tail-feathers, and in many cases the carpal spur is well developed. There are no apparent sex differences. Pileum rusty gray, markedly ruddy at times on forehead. There is a white patch above and below the eye extending backward toward the ear and diminishing in prominence. Lores, cheeks and sides of neck chocolate brown to dark wine-color; chin, throat and under side of neck chestnut to brick red. The mantle, scapulars, breast and sides are gray, very dark and lead-colored on sides of breast and often inclining to brick red on the breast, when the dark tips of the feathers are worn off. All these regions have the margins of the feathers a rusty or chocolate brown which in fresh plumage gives the whole bird a brownish or wine-colored look. Back, rump, tail and abdomen as in the gray phase. This plumage certainly may be retained for one year, and perhaps much longer. Possible transitions between this and the gray phase are discussed below.

Bill, in life yellowish above, and bluish or greenish below nostril, nail black. In dried skins nearly always dark lead-color all over culmen, sometimes slightly yellowish toward base, but never yellow all over as in *Tachyeres cinereus*. The bill is less "coarse;" smooth and without definite carunculation at base. Legs and feet yellowish, very nearly, if not quite the same as in *Tachyeres cinereus*.

Wings: male, average 286 mm.; female, 275 mm.; bill: male, average 52; female, 51; tarsus: male, average 60.3; female, 56. Individuals with a good deal longer wings have been recorded (Morgensen, 1917).

Weight from 7 to 8.9 pounds (3.17 to 4.03 kilograms).

This series of measurements from the Brewster-Sanford collection mostly from Ancud and Chiloe Island, brings out the curious fact that *although these "red" birds are much smaller in size and weight*

RED PHASE

STEAMER DUCK

GRAY PHASE

Male

Female

Downy Young

(under nine pounds as against ten to eleven pounds) their wings are actually longer. One of these, No. 2914, was shot while flying at Punto Delgado. It has a wing of 275 and weighed 8.4 pounds, and is typical of the dark reddish type.

The range of wing measurement of this type is from 277 to 295 mm. in the males and 262 to 285 in the females. A series of six females in this plumage from the Falkland Islands, taken in October and November, and thus at least one year old, are smaller, 255 to 275 mm., although they have no appearance of immaturity. Moreover, the condition of the sex organs in the "red" birds is not very different, at a corresponding season of the year, from that seen in the larger (gray) birds.

Intermediate Types: These consist of three specimens collected by W. S. Brooks in the Falkland Islands (now in Museum of Comparative Zoölogy) besides several in the Beck series (Brewster-Sanford collection). In these the top of the head is getting gray or nearly white, the sides of the head and neck are streaked with white to nearly pure white as in the adult of the gray type, while the chin and throat still contain varying amounts of brick red. The feathers of the upper side are a clearer gray, especially the mantle, while the scapulars and flanks still have wide brown edges. The bills of these specimens are not clear yellow, but yellow at the base and around the nostrils, while the coarse carunculated appearance begins to be noticeable. These birds (males) are one year or two years old, probably the latter.

Wing 270–275 mm. (in one case a very large spur); bill 52–60; tarsus 65–72.

We thus have some birds with an intermediate plumage which are larger (bill and tarsus) than those in the full red plumage but have wings of similar or shorter length!

Young in Down (see Plate 65): Very peculiar and distinctive in appearance. Top of head, nape and whole upper side light brown, more pearly gray on the mantle. Whole lower side pure white except the breast which has a faint buffy tinge. Lores and cheeks light buffy brown shading to almost white on sides of neck, while above, behind, and below the eye are indefinite whitish streaks forming, with a slightly darker streak between the bill and the eye, a definite "face pattern." Bill and legs dark lead-color in skins.

Note: If we consider the red types to be the younger plumages of a single common species, then it is probable that full maturity is not reached until two and one-half or three years. If we divide the Steamer Duck into two types (species?) then it seems likely that adult stages may be reached in a much shorter time.

DISTRIBUTION

The famous Steamer Duck is a resident of southern South America. It never fails to attract the attention of voyagers and it would, therefore, be unnecessary to give any except a few of the more important or recent references as to its occurrence.

It is very abundant in the Falklands (Abbott, 1861; Vallentin, 1901, 1904; W. S. Brooks, 1917; Beck, MS. notes), in Tierra del Fuego (Crawshay, 1907; Scott and Sharpe, 1912; Blaauw, 1912a, 1916a) and everywhere on the shores of the Straits of Magellan (Cunningham, 1871; Coppinger, 1883; Nicoll, 1908; Beck, MS. notes; etc., etc.). In Chile it is found on the coast as far north as Valdivia, and is quite plentiful on Chiloe Island (Philippi, 1868; James, 1892; Lane, 1897; R. Paessler, 1909; Quijada, 1910; Beck, MS. notes). According to G. E. Cox (1863) this bird is abundant on the Andean Lakes (Nahuel-huapi, Todos los Santos, etc.), and Mr. J. R. Pemberton collected specimens on Lago Felataufquen, Chubut. Oustalet (1891) and Dabbene (1910) both state that it occurs on the east coast of Patagonia, but the statement of Scott and Sharpe (1912) that it is found as far north as the mouth of the Rio Negro requires confirmation. C. V. Burmeister (1888) has reported it from as far north as Puerto Deseado.

GENERAL HABITS

THE Steamer Duck has aroused the interest and wonder of all travelers in the Straits of Magellan and among the Falklands from the earliest times to the present. The first mention of it was made by Pedro Sarmiento de Gamboa, who, writing in 1580, describes its peculiar habit of racing over the water at an astonishing speed. In 1740 the survivors of the WAGER were forced to resort to the use of this duck as food, and later in the eighteenth century Pernetty and Captain Cook described its habits (Cunningham, 1871). Darwin wrote about it in his account of the voyage of the BEAGLE.

Several pages could be written on the question whether or not there is more than one species of Steamer Duck, but this would not lead us much nearer a solution, for the necessary evidence has not all been collected. A careful study of a large number of specimens and all of the literature has finally convinced me that we cannot explain all the observed facts in field or museum on the basis of a single stable species. The data will be found recorded at some length under Description. Briefly, my reasons for this conclusion, which differs from that expressed by me in the Ibis for 1917 (page 116), are somewhat as follows.

First, we have the old, very large and white-headed type with yellow bills in both sexes which mate and apparently (always?) produce flightless young very clumsy and much like themselves. These adults are extremely large, always flightless and therefore strictly coastal in distribution, but their wings are not only very much smaller, relatively speaking, than they ought to be, but they are *actually* shorter by several centimeters than they are in the much smaller red type (*Tachyeres patachonicus*). If we classify the small red types as merely younger stages, then we must explain why the wing, instead of growing somewhat longer with age as it does in all other *Anatidæ*, does in fact get shorter! This I think is the greatest stumbling block to the one-species theory.

Second, we know that birds of the red type do mate and produce young and it is more than doubtful whether all these red birds are really young at all. They do not have this appearance, they are uniform in first plumage and some have large carpal spurs. They are smaller by two to four pounds than the gray types, but their *wings are longer.*

Third, we have some evidence from field observers and collectors who are well qualified to judge, that there are two species, or at least one species which is very variable and peculiar. Mr. Blaauw (1916a, 1921) stoutly maintained after his trip to Tierra del Fuego that there are two species. His life-long familiarity with the swimming birds entitles his opinion to much respect. Mr. R. H. Beck, who has written me at length and whose field notes I have carefully read, thought that there were two species (or at least a species and subspecies) and his opportunity for seeing

MAP 90. Distribution of Steamer Duck (*Tachyeres cinereus*)
Sporadic record indicated by cross (×)

Steamer Ducks in great numbers at Chiloe Island, the Straits and the Falklands lends value to his opinion. He shot many flying at Chiloe Island in May and June. On the other hand Lord William Percy who collected in the same region in December, January and February, 1923–24 (Chiloe Island, the Guaytecas Islands and the mainland coast from Pumalin north to fifty miles beyond Chiloe Island) at no time saw a Steamer Duck that could fly in spite of the fact that he always chased birds in order to try to make them fly. I do not see how this can be explained. Mr. W. S. Brooks, who watched many in the Falklands, thought that the problem might be settled on the basis of one species, highly variable and still in process of retrogression to flightlessness, but he felt certain that the power to fly was not associated with adolescence.

Fourth, there is evidence that some males of the larger gray type mate with small females of the red type in the Falklands which complicates this problem still more (Beck, MS.; W. S. Brooks, MS.). We do not know what the immatures from these various matings really look like, especially the young from small red male with small red female.

The older voyagers and naturalists held various opinions. King (1830) was the first to point out individual differences and maintained that there were two species: one, *Anas brachyptera* Latham, which was supposed to be entirely incapable of flight; and the other, which he called *Anas patachonicus*, smaller, somewhat different in details of plumage and capable of flight. This theory was not maintained by Cunningham (1871; 1871a) on the basis of his field work and his anatomical research. Oustalet (1891) revived the idea of two species and gave plates clearly representing the large gray type and the smaller rusty-red type.

The Steamer Duck inhabits both the salt and the fresh water. The form seen so commonly in the Straits is almost exclusively of the larger non-volant kind, while on the ponds of Tierra del Fuego and of Patagonia the smaller flying type predominates.

The skeleton presents a good many minor peculiarities, too numerous to mention, and some points in common with the Scoters, the Musk Duck (*Biziura*) and even with the Muscovy.

Wariness. In the natural state, when unmolested, the Steamer Duck is a very tame bird. This is the unanimous testimony of writers on the Falkland Islands, where they are rarely disturbed. There they allow one to approach within a few yards and show a good deal of curiosity. W. S. Brooks (MS.) says that if a dog disturbed some of them, others farther out would come in to see what the trouble was, and sometimes when he sat on the rocks they would come in and scan him as though they had never seen a human being before. In the interior of Tierra del Fuego, Blaauw (1916a) found them equally unsuspicious, but in the Straits of Magellan,

where they are constantly disturbed or pursued they are exceedingly wary and move off at the slightest indication of danger (Cunningham, 1871; Crawshay, 1907; etc.). William Percy made the following remarks about those he saw on the coast of Chile at the end of the breeding season. Where they are unmolested they are not naturally shy or wild, but very little persecution makes them so, and they then exhibit excellent judgment in the selection of rocks upon which to rest, places that are unapproachable from any direction without warning. This combined with their amazing speed when they get into the water, and their almost reptilian vitality makes them difficult to secure in frequented localities.

Daily Movements. Little has been written on this subject. Like other sea ducks they are day-feeders. William Percy has been kind enough to send me very full notes about his recent experiences with these ducks and I am glad to be able to quote them *verbatim*.

"The immature and non-breeding birds were in small parties or large packs which seemed to consist of one-, two-, and three-year-old birds and very few showed the white head of the adult male. The daily habit of these packs, one of which numbered 83 birds in the Guaytecas Islands, and another 87 birds at Pumalin (*i.e.*, Yelcho on the mainland), was to feed during high water along the fringe of kelp, and so soon as the rocks became uncovered, to split up into small parties, or more generally pairs, clamber up on to the rocks and spend the hours of low water preening and quarrelling. They are then most entertaining birds to watch for they seem possessed of only one idea apart from sleeping and preening and that is to defend the rock upon which they sit against all comers. There would always be birds floating along the edge of the rocks which had not found a suitable perch, and the possessors of a rock, if unable to deter newcomers from joining them by opening their beaks and 'making faces' at them, were frequently compelled to withstand a direct assault. The newcomer is generally repelled as he is at a disadvantage in clambouring up the rock, but such slight assistance as a swell giving him the necessary impetus not infrequently enables him to displace the holders of the rock of which the newcomer or newcomers then proudly take possession, ruffling up their feathers and 'making one more face' at the departing forms of the dispossessed. A small party is generally fairly friendly and will sleep peaceably for hours but amongst a large pack there is always a constant movement caused by this continual demand for a good rock.

"The most interesting habit of these birds which I noticed on the small islands off Chiloe was that they regularly left the sea more than once in the 24 hours and went considerable distances inland to springs of fresh water. On one island solely inhabited by breeding pairs, there were several large caves extending more than 100 yards into the hillside. At the head of these caves, and also at other places more than 300 yards from the sea and through more or less dense vegetation, were small

trickles of fresh water coming down the rocks. All round these spots the ground was trampled down and covered with the tracks of Steamer Ducks, and between every tide the fresh tracks of the birds could be seen imprinted in the sand leading from the sea and back to it. The tracks of broods were never seen at these places, but on one occasion in Jan. 1924 a pair of old birds with four downy young were discovered at the head of one of the largest caves. The male and two young broke past in the dark but the female was struck by a native with a stick and two of the young caught. All three were kept by one of the inhabitants of Ancud for some weeks but the female had been injured by the stick and eventually they all died.

"The natives say that the old birds go to these springs to drink fresh water and that they take their young to the caves to roost. That they nest on occasion in the caves is evident from several old nests which were seen, but it seems improbable that such a marine duck as a Steamer Duck requires fresh water. I noticed that there was a fine green slime where the water dripped down the rock and on one occasion saw a pair of old birds in another locality apparently 'grazing' on a large sloping face of rock where on subsequent inspection nothing could be seen but this same green slime. Whatever be the explanation of these extended peregrinations on dry land they constitute an interesting, and as far as sea ducks are concerned, unique habit in my experience."

Gait. Steamer Ducks are rather frequently seen on land, getting out on the rocks to bask in the sun or coming ashore on beaches. I have a number of photographs taken by W. S. Brooks in the Falklands showing groups of these ducks in resting positions, and from one of these Allan Brooks has taken suggestions for his admirable plate. Mr. Blaauw also photographed them standing or squatting on rocks in Tierra del Fuego. They come ashore also for nesting purposes and neither the gait nor the resting position is especially clumsy or upright.

Swimming and Diving. On the water this duck is particularly active and agile. W. S. Brooks (MS.) says they swim very low, like a Loon, with the little tail sticking up in a very ludicrous way. In diving they are especially expert (Blaauw, 1921), though they make considerable noise going under (W. S. Brooks, MS.). Ordinarily they stay in rather shallow water, often actually in the surf, when they show excellent judgment in diving through breakers if necessary (W. S. Brooks). It seems, however, that they cannot stay under very long, and they rarely resort to diving when pursued, excepting occasionally to dip under, only to come up again in a different direction. On such occasions they are said to come up with body submerged (Beck, MS.).

There is no doubt that individuals can fly at times for a long distance, over both land and water. Beck saw them cover at least a mile near the south end of Chiloe Island. Some of these flew heavily while others went into the air and flew perfectly well. Most of these volant birds weighed from five and a half to seven pounds.

Flight. The question of the flying powers of this duck has already been discussed at some length. It remains to say something of their curious habit of racing over the water when pursued. This is characteristic of the species and has aroused the wonder of all who have ever seen it. The birds go off at a remarkable speed, churning the water and giving very much the impression of a little "side-wheeler." In this performance the wings and feet undoubtedly both play a part, the wings being used to keep the body up and both wings and feet being responsible for the churning of the water (Nicoll, 1908). The speed attained by this method is quite remarkable. The older writers (Cunningham, 1871, *e.g.*) found that they could not be overtaken with a boat, however well manned, and they estimated the speed at twelve to fifteen miles per hour. Beck (MS.) notes that while pursuing them in a launch going eight miles per hour the birds gained for a time, but after about a mile they would begin to weaken and would soon be exhausted. The wings are not moved alternately, as Darwin thought, but simultaneously as in any other bird, although the great splashing gives the appearance of uneven locomotion. Vallentin (1904) thought that when the bird was suddenly alarmed it could really use its wings alternately and he even made some experiments on living birds!

These ducks are rarely seen in large aggregations. Pairs or small groups numbering from four to fifteen are the usual thing, though on occasion larger companies, such as forty-two (Blaauw, 1921), seventy-four (Beck, MS.) and even many hundreds (Cunningham, 1871) have been seen together. In the Falklands the young, after they are fledged and separated from their families, pack in large flocks (Vallentin, 1904).

Association with other Species. There are no other sea ducks in the region of the South Atlantic and the bird has the ocean pretty much to itself, although it is frequently seen near cormorants and gulls (Beck, MS.) and the Great Southern Grebe (Crawshay, 1907).

Voice. The note usually heard from the Steamer Duck is a hoarse, low snoring call, like that of a bull-frog, uttered rapidly. It has also been likened to the grunt of a domestic pig, but higher pitched. These notes are generally attributed to the female (Cunningham, 1871; W. S. Brooks, MS.), though Vallentin (1904) says they are uttered by the male at the approach of danger. Brooks described the female's note as a "hoarse low sort of snoring call, rather suggesting the leopard frog of New England, only uttered rapidly sometimes, and with considerable spirit." The male, William Percy says, has a variety of notes, the most frequent being a shrill *qu-i-e-u-ll* repeated about twenty times after which there is a quick *kek-kek-kek-kek*. This last is sometimes left out altogether. Brooks describes it as "a wheezy sneeze or cough, something like *kée-u-kée-u-kée-u*."

The trachea of the male is furnished with a large bony box on the (left?) side (Cunningham, 1871a; see also Eyton, 1838, pl. 2, fig. 2).

Food. The food appears to consist very largely of mollusks, though crustaceans and fish are also taken. Beck (MS.) found mussels from 5 to 55 mm. in length, as well as crabs and school-fish one and a half inches long in the stomachs of adults and small shells and gravel in the stomachs of downy young. In the Falklands he found small bugs and limpets three-fourths of an inch in diameter in the stomachs of specimens taken in October. Oustalet (1891) also speaks of remnants of fish being found, though Cunningham (1871) and Nicoll (1908) both state that they live chiefly on mussels (*Mytilus magellanicus* and *patagonicus*) which they find about the kelp beds. Evidently in feeding in the kelp beds they do not have to dive far to secure their food, as much of it lives on the vegetation. William Percy writes that the stomachs of twelve birds which he shot in the Chiloe Island region in December and January were all crammed to the gullet with small crustaceans, nothing bigger than a large shrimp and mostly "a small thing resembling a wood-louse which covers the leaves of the kelp." He found no crabs or large mollusks.

Courtship and Nesting. Nothing specific has been recorded concerning the display, but several observers have remarked on the pugnacious habits of these birds and their pursuit of one another in the breeding season.

The nesting season is variable and extends from the end of September (Abbott, 1861) to January and possibly to February (Oustalet, 1891; Crawshay, 1907). On the whole I should say that the bulk of the eggs must be laid in late October or early November, about the middle and late spring in those far-southern latitudes. Lord William Percy found that around Chiloe Island almost all the breeding birds had young by December 20.

The nest itself is invariably placed on the ground within a few yards of the water and under a bush or in the scrub. It is a very loose structure consisting of grass or twigs and lined with a good deal of down.

The average clutch numbers five or six eggs, though Abbott (1861) says he has found eight and even nine. These eggs are of a light cream color and average 83.2 by 56.6 mm. in size (Schalow, 1898; Vallentin, 1904). Wace (1921) claims that Bennett and Bridges agree with him that the eggs of the volant form are more pointed than those of the other. The nest-down is gray.

Nothing is known of the length of the incubation period, but during that time the male stays in the immediate vicinity of the nest. Indeed, in the Falklands the nest can be easily detected by searching the shore opposite which the male swims (Abbott, 1861). After the young are hatched both parents tend them until they are well grown (Cunningham, 1871; Beck, MS.). Abbott (1861) says that when the brood is surprised the female makes off with the young while the male remains behind and puts up a valiant fight. The broods mostly contain four to eight young and five seems about the average. Once the young are old enough to take care of themselves

they are deserted by the old birds. Indeed, Vallentin (1904) says that on the Falklands he has often watched the male driving the young away with strokes of the wings, sometimes by flying at them and sometimes by diving. Abbott (1861) also speaks of the male defending the territory from intruders. It is said that when once disowned by the parents the young bunch together, companies of from fifty to a thousand having been seen (Vallentin, 1904).

I think it is worth while to quote the following remarkable experience which William Percy had with a family of Steamer Ducks, for it shows that they are endowed with a very different psychological make-up from that seen among our more typical northern ducks. He writes:

"On Jan. 2, 1924, I was sitting on a small island in the Guaytecas group when a pair of Steamer Ducks with a brood of six came swimming amongst the kelp within 40 yards. They fed there for one half hour gradually getting to within 25 yards of where I lay. The young were not more than a week old and as I required a bird at that stage I finally decided to shoot one. Choosing the moment when one bird was separated from the rest I fired and killed it, turning it over in the water so that it lay on its back. The rest of the brood immediately took refuge at their mother's side and she and the male remained perfectly still where they were. I did not move and was then vouchsafed the most remarkable display of emotion that I have ever witnessed in a duck. The male remained gazing at the splash made by the shot for perhaps three seconds, then gave a harsh cry at which the remaining young dived at once. Then 'steaming' straight at the dead bird with beak wide open, and lashing the water into foam with wings and feet, he appeared on reaching it to be about to give it a violent blow with his bill, but instead dived under when within six inches of the dead body, reappeared a few yards beyond, 'steamed' on 15 yards, and then turned about and repeated the process. He must have repeated this performance 15 or 20 times before I was tempted to end his pathetic frenzy by shooting him, when he suddenly stopped, joined the female who had remained quite stationary with her brood at her side all the time, and went slowly off to sea apparently quite unconcerned. I had not moved, and do not think the birds had seen me at all. It seemed as though the male, on seeing the splash made by the shot, and his dead offspring in the middle of it, had concluded that something under water had done the damage, and I am now convinced that the rest of the performance was an attack on a supposed submarine enemy. In any case it was a most impressive spectacle which displayed as no other experience with these birds did, the astounding power which they can exert in the water, the surface of which was made to foam and boil as if a large fish was causing the disturbance."

Status. When the first travelers came to the Straits of Magellan the Steamer Duck was very abundant. It has probably diminished very little since that time, for

it is not much hunted and is difficult to get. Nicoll (1908) says it is decreasing in the Straits, but is still plentiful, especially in the western parts. He did not attribute this to the presence of man. On the Falklands where it is little hunted it is still exceedingly numerous, though some egg-robbing goes on there. It is probable, that as time goes on, and fast motor-boats become a common means of locomotion, this duck may be persecuted and even extirpated near settlements.

Enemies. There is little evidence on this point, but Beck (MS.) saw a Caracara Eagle break three out of a clutch of four eggs in the Straits.

Damage. None.

Food Value. Cunningham (1868) describes the flesh as tough, coarse and terribly fishy. Certainly no travelers ever eat it if they can get anything else. The eggs, on the other hand, are considered a great delicacy and are, to some extent, collected in the Falklands (Abbott, 1861; Crawshay, 1907).

Hunt. Where the Steamer Duck is wary, as in the Straits, it is very difficult to get them. About all one can do is to wear them out by pursuing them or by cornering them in some small cove. On account of their size and toughness they require heavy shot. Mr. R. H. Beck's field notes made on his collecting trips to the coasts of Chile and in the Straits contain many references to the pursuit of these birds. He usually managed to follow them up in a motor-boat and gradually tire them out. It was even possible to get the flying kind in this way. On being pursued this duck, of course, dives or "steams" over the water but when tired out it dives and comes up with body submerged and head close to the water.

A few were shot by simply "staying with them" until they miscalculate or the shooter calculates their position correctly under water so as to shoot them immediately the head appears. One day at Ancud Mr. Beck got eleven small flying Steamer Ducks in this way. On another day he notes that by hard hunting he got eighteen, missing and hitting a number, while others dove and got away. In the Falklands it is still easy to shoot as many as one wants, even without a launch, by hunting along the shores.

Behavior in Captivity. In 1861 and again in 1882 the London Zoological Gardens received a specimen of this duck (P. L. Sclater, Proc. Zool. Soc. London, 1861, p. 367, and 1882, p. 792). In 1888 a pair was received (Hubbard, 1907). Nothing has been recorded of their behavior in confinement, but P. C. Mitchell (1911) reports one as having lived fifteen months.

Hybrids. None.

GOLDEN-EYE

BUCEPHALA CLANGULA (Linné)

(Plates 66, 68, 69)

Synonymy

Anas clangula Linné, Systema Naturæ, ed. 10, vol. 1, p. 125, 1758.
Anas glaucion Linné, Systema Naturæ, ed. 10, vol. 1, p. 126, 1758.
Anas marila Pallas (*nec* Linné), Reise, vol. 2, p. 25, 1773.
Anas peregrina S. G. Gmelin, Reise d. Russlands, vol. 2, p. 183, pl. 16, 1774.
Anas melanocephala Hermann (*nec* Gmelin), Observ. Zool., p. 145, 1804.
Anas hyemalis Pallas (*nec* Linné), Zoographia Rosso-As., vol. 2, p. 270, 1811.
Clangula clangula Fleming, Philosophy of Zool., vol. 2, p. 260, 1822.
Clangula chrysophthalmus Stephens, General Zool., vol. 12, pt. 2, p. 182, pl. 56, 1824.
Platypus glaucion Brehm, Lehrbuch Europ. Vögel, p. 837, 1824.
Fuligula clangula Bonaparte, Ann. Lyceum Nat. Hist. New York, vol. 2, p. 393, 1826.
Clangula vulgaris Fleming, British Animals, p. 120, 1828.
Glaucion clangula Kaup, Natürl. Syst., p. 53, 1829.
Clangula peregrina Brehm, Oken's Isis, p. 999, 1830.
Clangula glaucion Brehm, Oken's Isis, p. 999, 1830.
Clangula leucomelas Brehm, Vögel Deutschlands, p. 927, 1831.
Fuligula vulgaris Hewitson, Col. Illustr. Eggs British Birds, ed. 3, p. 435, 1856.
Platypus clangulus Hintz, Journ. f. Ornith., vol. 9, p. 464, 1861.
Bucephala clangula G. R. Gray, Hand-list Genera Birds, vol. 3, p. 87, 1871.
Clangula glaucium Hume, Stray Feathers, vol. 8, p. 115, 1879.
Glaucionetta clangula Stejneger, Proc. U.S. Nat. Mus., vol. 8, p. 409, 1885.
Additional synonymy under Geographical Races.

Vernacular Names

English: Golden-eye, Whistler, Whistle-wing, Whiffler, Merry-wing, Brass-eye, Bright-eye, Great-head, Cub-head, Bull-head, Iron-head, Cur, Jingler, King Diver, Garrot, Magpie Diver, White-faced Dunbird, Rattler, Rattle-wing, Bell Duck, Bell-ringer, Red Diver, Morillon, Winter Duck, Gowdy Duck, Pied Curre, Whewer, Fresh-water Widgeon, Popping Widgeon.

German: Schellente, Schallente, Klangente, Klingelente, Klapperente, Quakente, Schreier, Kobelente, Straussente, Dickkopf, Eisente, Baumente, Hohlente, Scheckente, Goldäuglein, Ententaucher, Knobbe, Birkente, Vieräuglein.

French: Garrot, Garrot vulgaire, Garrot commun, Têtard, Têtard à cocardes,

GOLDEN-EYE

Female Male

BARROW'S GOLDEN-EYE

Male Female

Morillon sonneur, Canard pie, Canard à yeux d'or, Oeil d'or, Pilet nonnette, Pilet à lunettes, Jaffre blanc, Boui blanc, Quatre yeux.

Italian: Quattr'occhi, Domenicano, Bianchetton, Bugan, Giurgiul, Campanato, Scavuzza, Munacuna, Anadi furistera.

Spanish: Retor, Perdigana d'aigua.

Welsh: Hwyaden lygadaur.

Icelandic: Skelliönd, Erlend Husönd.

Dutch: Brileend, Brilduiker, Knob, Bolder, Belder.

Helgoland: Lügen-vog, Witt-sitted.

Faroes: Aöndt.

Czech: Hohol.

Norwegian: Hvinand, Kvinand, Lundand, Skjaere-and, Dup-and, Knip-and, Fjeld-and.

Swedish: Knipa, Dopping, Hvitsida, Blaand, Skörand, Stomand, Stutand, Blank-hane, Mögelhane, Isand, Knortand, Skatand.

Danish: Hvinand, Firöine, Krikand, Bruskop, Blankeknjo, Flemand, Splitdykker, Brunnakke.

Finnish: Sotka, Tellkä, Vinkusuorsa, Selkätelkkä.

Lapp: Coadgi.

Russian: Gogol, Gogolek.

Polish: Kaczka krzykliva.

Esthonian: Nihra, Duh keris.

Dalmatian: Batoglavica.

Croatian: Noska svrakarica, Patka bataglavica.

Bosnian: Ribarica, Bronzulja.

Hungarian: Kerce rucza, Jég récze.

Montenegrin: Glavoč.

Maltese: Braimla zghira, Braimla talghain.

Ukranian: Kraekushka.

Bashkir: Alasabar.

Lamut: Kongala.

Surgut: Toron-sankeni.

Ostiak: Lobtai.

Turkestani: Iyriok Ulkum-bash.

Punjabi: Burgi.

Korean: Ilygali.

Kamchatka: Guiku, Ngukun-guku.

Kuriles: Chach-chir.

Japanese: Hojirogamo.

Eskimo: Katjitok (northern Labrador), Yasikh (Alaska).

DESCRIPTION

Adult Male: Head and upper neck dark metallic green, purplish in certain lights. Between the base of the bill and the eye a large rounded white patch. Lower neck, breast and abdomen pure white, except for a few grayish feathers about the thighs and vent. Flanks with a few long feathers margined with black. Under tail-coverts white. Anterior part of the mantle white, posterior part black merging with the black of the central scapulars, back, rump and tail. Outer scapulars white, or white with black borders. Wing black, with a large white patch on the central coverts and the inner secondaries. Primaries dark brown.

Iris golden yellow. Bill black or blue-black. Legs and feet orange, brighter in spring; webs grayish.

Wing 216–231 mm.; bill 33–41; tarsus 35–41.

Weight 2 pounds, 6 ounces to 2 pounds, 10 ounces (1.07 to 1.19 kilograms).

Adult Female: Head and upper neck hair brown, changing rather abruptly into a broad collar, which is whitish below and grayish above. Mantle and scapulars dark slate gray, the margins of the feathers being lighter in color. Back, rump and tail almost black. Upper breast pale gray; lower breast and whole abdomen pure white. Sides and flanks pale gray. Under tail-coverts white. Wing dark gray, but the median coverts are broadly tipped with white, and the greater ones are white, tipped with black. Outer secondaries white, primaries dark brown to black. Under wing grayish white.

Iris golden yellow. Bill bluish black; but in breeding season bright yellow at the tip. Legs and feet yellow or orange yellow, with the webs blackish.

Wing 190–216 mm.; bill 28–35; tarsus 33–36.

Weight 2 pounds to 2 pounds, 8 ounces (0.90 to 1.13 kilograms).

Female in First (Juvenal) Plumage: At first the head is paler than in the adult female and the white collar is entirely absent. The whole upper side, as well as the upper breast is brownish rather than grayish, and the tips of the tail-feathers are more or less blunted. The bill lacks the yellow spot at the tip and is dark olive color as a rule.

Young Male in First (Juvenal) Plumage: In August and September it may be impossible to tell the sexes of young birds except by the greater size of the male. Beginning, however, in October some young males of the year have a few dark feathers coming in on the sides of the head and neck or around the area which is to form the white face-patch. The whole head as well as the back and rump may be richer and darker than in the young female. About the same time a few white feathers may usually be found among the scapulars. The white face-patch appears in some cases by mid-October, but in others not before March. Progress toward maturity is very slow and many males looking essentially like females are found all through the winter.

Weight 2 pounds, 2 ounces to 2 pounds, 4 ounces (0.96 to 1.02 kilograms).

Immature Male: During February, March and April the appearance of the young male changes more rapidly, and while the scapulars assume the whiteness of maturity the head becomes much darker and the neck-collar lighter. But adult plumage is not assumed the first year. Probably few males are in perfect feather before nineteen or twenty months of age.

Male in Eclipse: I have not seen what I should consider a full-eclipse specimen, but old males with somewhat delayed plumage taken in October give a good picture of what this must be. The head becomes mostly brown, retaining some green on the occiput, and the white face-patch disappears. The lower neck, mantle and upper breast become gray, perhaps mixed with some white feathers, and the inner scapulars, back, and rump become more brownish, the former having light edges to the

feathers. The sides and flanks are brown or gray-brown, but the wing, of course, retains the white patch on the coverts and secondaries. Millais thinks that the central scapulars, back, tail-coverts, tail, breast and abdomen, as well as the wing regions are moulted only once. This is certainly true as regards the wings and tail, but whether it is equally true of the other regions, I am not prepared to say. The authors of the Practical Hand-list (Witherby *et al.*, 1919–22) agree nearly with Millais.

I have seen old males at Wenham in nearly full plumage in the middle of October, but this is unusual simply because these do not usually reach us until much later. Harper saw full-plumaged birds near the Athabasca River as early as October 16 and 17; so that I have no doubt that the moult from eclipse to nuptial takes place rather early in the autumn in many adult males.

Young in Down (Plate 68): Very characteristic of the genus and easily distinguished. The whole top of the head to well below the eye, and a streak down the back of the neck sooty black. All the face below this, as well as the chin and throat pure white. A collar around the neck black, as well as whole upper side, except for the prominent white scapular-, wing- and rump-spots. The abdomen below the black neck region which shades into a gray on the upper breast, is pure glistening white, without a trace of the sulphur yellow or buff color so characteristic of many species. It resembles that of the Barrow's Golden-eye and differs only in size from the downy young of the Buffle-head.

DISTRIBUTION

The Golden-eye is one of the more northern of the holarctic species, extending throughout the three continents of the northern hemisphere, but its habit of nesting in trees confines its range in summer to the wooded regions of the north, beyond which it is only occasionally found as a straggler or as a summer excursioner.

Breeding Range

In North America the breeding range extends as far north as Alaska. A specimen was taken on St. George Island, Pribilovs, on May 6 (G. D. Hanna, 1920) but it is a rare bird on the coast of Alaska, excepting at the mouth of the Yukon (Nelson, 1887) and farther south on Cook Inlet, where it was the commonest duck in the breeding season (Loring, 1902). In the interior it breeds abundantly throughout the basins of the Kuskokwim and Yukon (Dall and Bannister, 1869; Nelson, 1887; Osgood, 1909; Dice, 1920). **North America** **Alaska**

The breeding range in northwestern Canada extends nearly as far as the mouth of the MacKenzie, where Stefánsson (1913) saw a few in late June. R. MacFarlane (1908) is sure that he saw it at Fort Anderson and the United States National Museum received specimens from there (Preble, 1908). Ross (1862) speaks of seeing it on the MacKenzie as far north as the mouth, and Preble (1908) found it rather common in June, between Forts Norman and Good Hope. Farther south the species has been found breeding on the Pelly Lakes (U.S. Biological Survey) and about Fort Rae (Baird, Brewer and Ridgway, 1884) and has been seen by several explorers about Great Slave Lake and along the Slave River (Preble, 1908; Seton, 1911). About the western end of Lake Athabasca and along the lower Athabasca River it is especially abundant (Preble, 1908; Seton, 1911) and Mr. Francis Harper (MS.) found it nesting commonly in that region as well as at Egg Lake, northeast of Fort Chipewyan. **Northwest Canada**

Although older writers have reported the Golden-eye breeding in southern British Columbia it is very likely that they confounded the present species with Barrow's Golden-eye. Allan Brooks writes me that he has no absolute evidence of nesting except a female and two half-grown young seen at Sumas Prairie in the coast district in August, 1895. It is probably rare or absent from the more mountainous parts, where Barrow's is common. In northern Alberta it was seen by Spreadborough (*fide* J. and J. M. Macoun, 1909) about Lesser Slave Lake and the upper Peace River, and as already remarked, it is an abundant breeding bird along **British Columbia** **Alberta**

the Athabasca. Farther south it nests rather rarely about Edmonton (Stansell, 1909; Taverner, 1919) and Buffalo Lake (C. B. Horsbrugh, 1915, 1918) though it does so commonly along the upper Red Deer River (Taverner, 1919). In Saskatchewan, J. and J. M. Macoun (1909) found Golden-eyes nesting near Methye Portage, La Loche Lake (Buffalo Lake) and Buchanan (1920) saw large numbers in May and June along the Beaver and Churchill Rivers, taking one in September as far north as Fort du Brochet. Raine (1892) says he took nests at Indian Head and Ferry (1910) records finding the species at Quill Lake in June and July. It is evidently not a common nester in Manitoba, though it is recorded to have bred at Reaburn, Shoal Lake, Swampy Island, Waterhen Lake and Qu'Appelle (E. E. Thompson, 1891; J. and J. M. Macoun, 1909).

Saskatchewan

Manitoba

In Keewatin, Preble (1902) found Golden-eyes rather common between Norway House and Oxford House in July, and observed others all along the Hill and Hayes Rivers to York Factory. J. and J. M. Macoun (1909) say that specimens have been taken even at Fort Churchill, and Forster (*fide* Preble, 1902) noted it along the Severn River. In southern Ontario the species is known to have nested once near Sudbury (U.S. Biological Survey) and it is said to have done so near Ottawa in 1894 (White, *fide* J. and J. M. Macoun, 1909). In northern Ontario Spreadborough (*fide* J. and J. M. Macoun, 1909) found it a common breeding bird along the Missinabi and Moose Rivers. Eastward in the Province of Quebec, Low (1913) met with the species on Lake Mistassini in May and on the upper Hamilton River. L. M. Turner (MS.) took a specimen in July on Davis Inlet and specimens are said to have been seen as far north as Ungava Bay (Cooke, 1906) but C. W. Townsend and Allen (1907) state that it breeds only south of the Hamilton River and along the northern coast of the Gulf of St. Lawrence, as at the mouth of the Mingan River, near Eskimo Point, Godbout and Natashquan (C. W. Townsend and Bent, 1910; Comeau, 1909; U.S. Biological Survey). It is said to be resident also on Anticosti (Schmitt, 1904), while in Newfoundland it is a rather common breeding bird (Porter, 1900; Arnold, 1912). It nests also on the Gaspé Peninsula (C. W. Townsend, 1920a), on Prince Edward Island (MacSwain, 1908) and in New Brunswick (Philipp and Bowdish, 1919) and is said to do so in northern Nova Scotia, too (Downs, 1888).

Keewatin

Eastern Canada

Labrador

In the eastern United States the Golden-eye nests in northern Maine in some numbers (O. W. Knight, 1908; and others), in western Maine on Lake Umbagog (Brewster, 1900) and in northern Vermont (Cooke, 1906; U.S. Biological Survey) as well as in northeastern New York and in Onondaga County (Eaton, 1901). Farther west Golden-eyes nest in northern Michigan (Cooke, 1906), in northern Wisconsin (Kumlien and Hollister, 1903), in northern Minnesota (Roberts, 1919; C. E. Johnson, 1920), in North Dakota (Job, 1899; Bent, 1901–02; V. Bailey, U.S. Biological Survey), in northwestern Montana (A. A. Saunders, 1921) and in Wyoming (Cary, 1917). No doubt a few breed in Washington, too. It is said to be a rare summer resident in eastern Oregon (Pope, 1895–96) and occurs in the Barr Lake region of Colorado in summer (Felger, 1909). In fact a specimen, presumably a crippled bird, was taken as far south as Cat Island, off the Mississippi coast as late as June 15, 1894 (Beyer, Allison and Kopman, 1907).

Eastern States

Central States

Western States

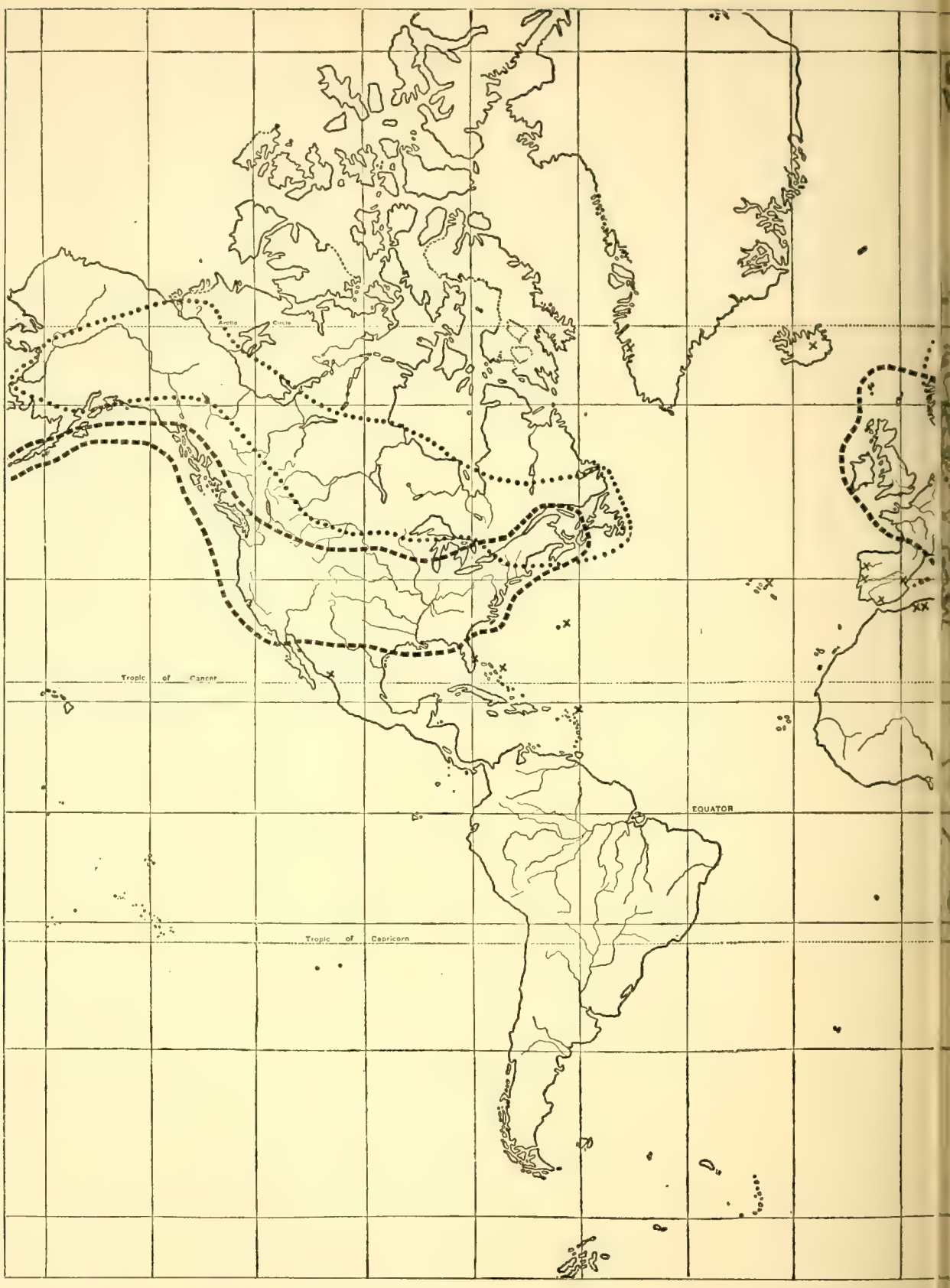
The Golden-eye does not occur regularly in Greenland, though it has been taken there once near Gothaab on January 16, 1906 (Schiöler, 1907), and it is not a regular visitor to Iceland. There are several records of its occurrence there in summer (Slater, 1901; Hantzsch, 1905) and it very probably nests there occasionally, escaping notice because of its similarity to Barrow's Golden-eye. Millais (1913) says he saw a female and young on the Sog River in July. It is not known to breed on the Faroes or Shetlands, though on the latter group and in parts of Scotland the species has been repeatedly seen in summer and very young birds, hardly capable of migrating, are seen in August (Seebohm, 1885; H. Saunders, 1899; Millais, 1913; Witherby *et al.*, 1919–22). The several notices of its breeding in England are unsatisfactory.

Europe

Greenland

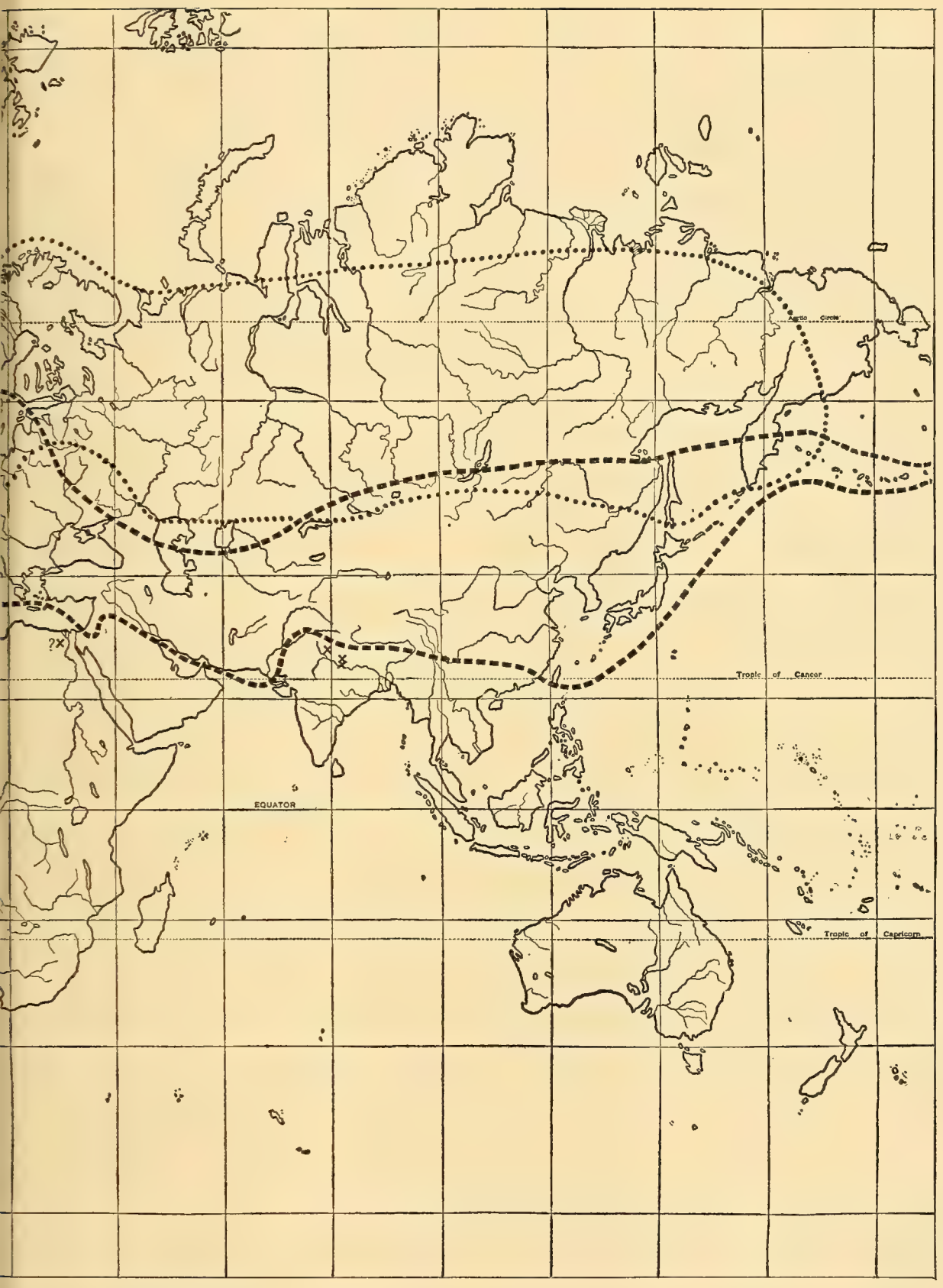
Iceland

British Isles



MAP 91. Distribution of

Breeding range, dotted
Sporadic records



n-eye (*Bucephala clangula*)
inter range, broken line
ed by crosses (×)

MAP 91. Distribution of Golden-eye (*Bucephala clangula*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

In Scandinavia the Golden-eye nests throughout Norway, though less commonly south of Dovrefjeld (Palmén, 1876; Schaanning, 1913; Millais, 1913), and in Sweden rarely south to Wermland and Smaland and commonly north of about 62° north latitude (Wallengren, 1854; Nilsson, 1858). It is an abundant nester in central and northern Finland, extending northward as far as the wooded areas, that is, practically to the Arctic coast (von Nordmann, 1864; Palmén, 1876; S. A. Davies, 1905; Suomalainen, 1908; Finnilä, 1913, 1914; Montell, 1917; etc.). It is not known to have ever nested in Denmark, though it does so in Holstein (Naumann, 1896–1905), Mecklenburg (Wüstnei, 1902), Pomerania (Plathe, 1904), Brandenburg (Jäger, 1910; Schalow, 1915), East Prussia (Naumann, 1896–1905), Lusatia (Hantzsch, 1903), Silesia (Flöricke, 1891) and Saxony (Mayhoff, *fide* Hartert, 1920a). It is said to have bred also in Cantons Glarus and St. Gall, Switzerland (Fatio and Studer, *fide* Millais, 1913).

Scandinavia

Germany

A few Golden-eyes breed as far south as the mountains of Montenegro (Reiser and von Führer, 1896) and in the Dobrudja (von Dombrowski, 1904). The species has not been found nesting in Poland, though it does so rarely in Latvia and Esthonia (Loudon, 1909). In Russia it nests abundantly in the north. Rae (1881) met with it on the Tuloma River, Kola Peninsula, Witherby (1900) found it common between Kola and Kandalax, and H. J. Pearson (1904) states that it nests in Russian Lapland. About Archangel it is a common breeder (Goebel, 1873a; Seebohm, 1882a) and about the lower Petchora it was also frequently seen (Seebohm, 1880). Farther south it nests commonly in Olonetz (Bianchi, 1914) and about Lakes Ladoga and Onega (Sievers, 1877) as well as in Novgorod (Bianchi, 1910). In Petrograd Government it is much less abundant (Bianchi, 1907) and in central Russia the breeding range does not extend south of Moscow and Tula (Menzbier, 1881). To the eastward the species nests in Jaroslav and Kostroma (Sabanäeff, *fide* Dresser, 1871–81), throughout Perm (Harvie-Brown, 1878), rarely in Ufa (T. Pleske, 1878) and Kasan (Russki, 1893) and occasionally as far south as Astrakhan (Moeschler, 1853; Seebohm, 1882).

Balkans

Russia

Suschkin (1914) states that the Golden-eye nests in the Ilezk region of the Kirgiz. Smallbones (1906) saw specimens late in the season on the Ili, and others have been taken as late as May in Pamir (Schalow, 1908). Farther north it is a common nesting bird about the Markakul, Tomsk and Tobolsk (Ushakov, 1913; P. and J. Zalesski, 1915; Poliakov, 1916). Suschkin (1913) states that it breeds in the Russian Altai, about Minussinsk and throughout the Jenesei Basin. Popham (1898), too, found it a very common breeder on the Jenesei. Maak (1859) saw it commonly about Irkutsk and on the Shilka and Amur Rivers, and Radde (1863) also saw it at Irkutsk in the breeding season. About the junction of the Wiljui and the Lena, Maak (1859) found it nesting commonly, and Hartert (1904) has reported specimens taken in July near Miankiaria on the Lena. On the Suiffu and Ussuri Rivers it is scarce (Dörries, 1888), but farther north A. T. von Middendorff (1853) found it quite common in the Stanowoi Mountains and Riley (1918) has recorded a specimen taken on the Annui River as late as October 4! The species presumably nests in Kamchatka, where it has been seen in June and August (Barrett-Hamilton, 1900; Bianchi, 1909) and on the Commander Islands, where specimens have been taken in April and May (Hartert, 1920). Some, evidently breeding, were also taken at Hagdusa, Saghalin, on May 11 (Hesse, 1915).

Western Asia

East Siberia

Winter Range

In North America the Golden-eye winters as far north as the Pribilovs (G. D. Hanna, 1916, 1920), the Aleutians (Nelson, 1887; L. M. Turner, 1886) and commonly in southeastern Alaska (Willett, 1921), Vancouver (Taverner, 1917) and British Columbia (Fannin, 1891; Kermode, 1904).

Alaska

British Columbia

It occurs during the cold season in most of our States, but is more abundant on the coasts and in the northern Great Lakes region. It is abundant in Washington (W. L. Dawson and Bowles, 1909;

Rathbun, 1915) and in Oregon (Woodcock, 1902; Jewett, 1914), though in California it is much less common, becoming rare in the southern parts (Grinnell, Bryant and Storer, 1918) with the exception of Salton Sea (Hogg, Field and Stream, April, 1923). According to Cooke (1906) it has been taken in northeastern Lower California and G. N. Lawrence (1874) quotes Grayson as saying that it is a common bird at Mazatlan, Mexico, in winter.

Pacific Coast

In the interior it winters commonly as far north as western Montana (A. A. Saunders, 1921), Wyoming (Preble, U.S. Biological Survey), Colorado (Felger, 1909; L. J. Hersey and Rockwell, 1909) and rarely in Arizona (Swarth, 1914) and New Mexico (Leopold, 1919). East of the Rockies it is found as far north as Lake Superior (Roberts, 1916; Hatch, 1892) and Lake Michigan (Kumlien and Hollister, 1903) and thence south in Nebraska (Bruner, Wolcott and Swenk, 1905), Iowa (R. M. Anderson, 1907), Kansas (Goss, 1891), Missouri (Widmann, 1907), Arkansas (Howell, 1911) and Louisiana (McIlhenny, 1897; Beyer, Allison and Kopman, 1907). It is fairly common about the mouth of the Mississippi, but very rare on the Gulf coast of Texas (Strecker, 1912). Griscom (1920) has recorded it from San Antonio, and McAtee (U.S. Biological Survey) has taken specimens at Lake Surprise and at Rockport, Texas.

Interior Mississippi Valley

East of the Mississippi the Golden-eye is found regularly about the Great Lakes, in Wisconsin (Kumlien and Hollister, 1903), Illinois (Ridgway, 1895), Michigan (Barrows, 1912), Indiana (A. W. Butler, 1898), Ohio (L. Jones, 1903; W. L. Dawson, 1903), Pennsylvania (B. H. Warren, 1890), New York (Eaton, 1910) and even Toronto (Fleming, 1906) and Ottawa (C. W. G. Eifrig, 1910).

Great Lakes

On the Atlantic coast it will, in mild winters, stay as far north as Anticosti (Schmitt, 1904; Comeau, 1909), New Brunswick (Chamberlain, 1882) and Prince Edward Island (Bain, 1885). In Nova Scotia it is common (Downs, 1888) and the same is true of the coasts and the open rivers of New England (G. M. Allen, 1909; etc.). In New Jersey (W. Stone, 1909) and Delaware (Rhoads and Pennock, 1905) as well as in Maryland (Kirkwood, 1895) and in Virginia (Rives, 1890) it is also common. Contrary to most information it is common on the coast of North Carolina and even in South Carolina as far as Charleston it is at times not rare (Wayne, 1910; and others). In Florida it occurs only sporadically. Scott (1888) took a specimen on the Anclote River, and G. C. Fisher (1910) took two at De Funiak Springs, western Florida. Of the few occurrences on the Atlantic side one is that of a specimen taken at Cape Canaveral and now in the Museum of Comparative Zoölogy, Cambridge, Massachusetts. Audubon also mentioned it in Florida. Off the coast it has been taken a few times on Bermuda (J. M. Jones, 1859; Reid, 1884) and was once seen at sea near the Bahamas (Cooke, 1906). G. N. Lawrence (1878) has recorded it from Barbuda in the West Indies! As already noted, the only record of its occurrence in Greenland is a winter record for Gothaab, January 16, 1906 (Schiöler, 1907). A few of the records for Iceland also apply to wintering birds (Slater, 1901; Hantzsch, 1905).

Atlantic Coast

Europe

Greenland

Iceland

On the Faroes it is not rare (H. C. Müller, 1869) and on the Shetlands it is a regular winter bird (A. H. Evans and Buckley, 1899). The same is true of the British Isles where the Golden-eye is common and generally distributed especially on the coasts during the cold weather (Seebohm, 1885; H. Saunders, 1899; Ussher and Warren, 1900; Millias, 1913; Witherby *et al.*, 1919–22; etc.). On the Continent it winters commonly on the southern coasts of Norway (Schaanning, 1913) and Sweden, north to about 60° (Wallengren, 1853; Nilsson, 1858) and on the coasts of the Baltic States (Sawitzky, 1899). A few also winter in Poland (Taczanowski, 1888; Prazák, 1898), while in Germany it is a common bird on the coasts and in the Rhine basin (Naumann, 1896–1905; Reichenow, 1889; W. and T. Heussler, 1896; R. Blasius, 1896; Le Roi, 1906–07; Hammling, 1917). It is fairly common in Denmark (Kjärbölling, 1850) and on the coasts of Holland (Schlegel, 1859), Belgium (Dubois, 1886) and northern and southwestern France (Ternier and Masse, 1907; Paris, 1907).

Faroes

British Isles

Baltic Countries

Low Countries

France

In Portugal it is a very rare bird (Tait, 1896; de Seabra, 1910) and in Spain it can hardly be considered more common (Irby, 1875; Arévalo y Baca, 1887). There is one record of its occurrence in the Azores (Hartert and Ogilvie-Grant, 1905) and in northwest Africa it is very uncommon. In Morocco it is rare, if it occurs at all (Hartert and Jourdain, 1923). Buvry (1857) and Loche (1867) state that it occurs occasionally in Algeria, and it has been recorded from Porta Farina and Biserta, Tunis (Talamon, 1904; Millet-Horsin, 1912). It is not a common bird in Sardinia (Salvadori, 1865; Brooke, 1873) nor in Corsica (J. Whitehead, 1885; Jourdain, 1912), while on the southern coast of France it occurs only during severe winters (Paris, 1907; l'Hermitte, 1916). In Malta it is a very rare bird (C. A. Wright, 1864; Despott, 1917) and in Italy it is nowhere common excepting about Venice, though specimens have been taken in all Provinces (Giglioli, 1886; Arrigoni degli Oddi, 1904).

Portugal
Spain
Azores
Northwest Africa
Mediterranean
Italy

In Switzerland, however, it is common (Fatio, 1904). The same is true of Czecho-Slovakia (Fritsch, 1872; von Tschusi zu Schmidhoffen, 1911), Austria (Rudolph and A. von Brehm, 1879; Mojsisovics von Mojsvár, 1897) and the Dalmatian coast (Kolombatovič, 1903) as well as of Hungary (Schenk, 1906a), Montenegro (Reiser and von Führer, 1896), Greece (Lindermayer, 1860; Powys, 1860; Reiser, 1905), Bulgaria (Sintenis, 1877; Radakoff, 1879; Alléon, 1886) and Rumania (Danford and Harvie-Brown, 1875). Many also winter in southern Russia, north as far as Charkow (von Nordmann, 1840; Radde, 1854; Czernay, 1852; Valkh, 1911). In the Caucasus it is a very common winter bird (Seebohm, 1883; Radde, 1884).

Central Europe
Balkans
Russia

A. E. Brehm (1854) says he saw Golden-eyes on Lake Menzaleh, Egypt, but no observer since his time has mentioned its occurrence in that part of Africa.

Egypt

In Palestine the Golden-eye is rare (S. Merrill, 1903; Meinertzhagen, 1920) but it is said to be common on the coast of Asia Minor (Braun, 1908) and fairly so in Mesopotamia (Meinertzhagen, 1914; C. B. Ticehurst, Buxton and Cheesman, 1922).

Asia
Palestine
Asia Minor

It winters in all suitable parts of Persia (Radde, 1886; Zarudny, 1911; Baker, 1919) and has been seen in Transcaspia in February (Loudon, 1910). It no doubt remains throughout the cold season on many of the lakes of southern Siberia and central Asia, and all over Turkestan excepting the desert southwest (Lansdell, 1885; Severtzoff, 1883). Menzbier (Zarudny, 1885) records it from Kashgaria in December, and Smallbones (1906) found it pretty common on the Issyk-kul in winter, while Hesse (1913) records specimens taken on Lake Telezker in the eastern Altai at this season. Both Maak (1859) and Radde (1863) state that numbers remain on Lake Baikal during the winter.

Persia
Central Asia
Southern Siberia

Farther south it is much rarer, as in Afghanistan (Hume and Marshall, 1879) and Baluchistan (Baker, 1921; Meinertzhagen, 1920). It seems to occur regularly though rarely on the middle and upper reaches of the Indus and probably on other Punjab rivers (Baker, 1921). Elsewhere in India it is only a straggler, specimens having been taken near Rurki, Gorakpur and Lucknow. Farther east, on the middle Brahmaputra, that is, in Lakhimpur, it is a regular and not uncommon visitor in winter (Baker, 1921).

India

In western China specimens have been taken in winter at Yachow and Kiating, Szechwan (Thayer and Bangs, 1912; E. H. Wilson, 1913). Swinhoe (von Heuglin, 1874a) has reported it from as far south as Amoy and La Touche (1892, 1900) from Foochow and northwestern Fukien. R. Swinhoe (1873) and Styan (1891) met with it at Ningpo and Shanghai, and La Touche at Chin-kiang. Kleinschmidt (1913) includes it in his list of the birds of Kiau-chow. About Peking and in northeastern Chili it is more common (David and Oustalet, 1877; La Touche, 1921). C. W. Campbell (1892) and A. H. Clark (1910) found the species in Korea in winter.

China

The Golden-eye is included by R. Swinhoe (1863) in his list of Formosan birds. It has not, I think, been taken on the Loo-choo Islands, but it winters throughout Japan including Yezo and the Kuriles

(Seebohm, 1890; Hatta and Murata, 1905–06; Kuroda, *in litt.*). On the mainland some winter on Lake Hanka (Prjevalski, 1878), and it has also been taken in the cold season on Saghalin Island (von Schrenck, 1859). According to von Ditmar (1900) they winter even in Kamchatka. On the Commander Islands they do so regularly, though not commonly (Stejneger, 1887; Bianchi, 1909; Hartert, 1920).

Japan

East Siberia

Migration

There can be no doubt that in summer the sexes separate and also that the females and young migrate much earlier than old males. The evidence on this point from all parts of the world is quite conclusive and unanimous.

The winter distribution of the sexes is more complicated. There are many regions, such as the coasts of England, southern Styria, Italy, southern Russia, Greece, Bulgaria, Dalmatia, etc., where observers have noted the remarkable preponderance of females and young and the great scarcity of males, while the opposite is true of many northern regions. It would be tempting to hazard the opinion that the males never go so far south as the others, and this fits many cases, but not all. It is true, of course, that the young are very much commoner on fresh waters, while the males take more direct routes to the open coast and are not seen on migration nearly as frequently. Then there are certain places, even in latitudes where females and young abound, where a good many males also exist, but somewhat apart from the rest. I was surprised at finding any number of old male Whistlers as far south as Pamlico Sound, North Carolina. There again it is difficult to estimate the proportions of the sexes for the old males are so showy, so restless and so noisy on the wing that one is constantly aware of their presence.

There is nothing particularly remarkable about the migration dates of the Golden-eye, excepting that they are very irregular and extended, due to separation of the sexes. The females and young move much earlier in the autumn. Like all far-northern breeding ducks they leave for their nesting grounds late, usually not until well into March or in April. The northern breeding areas are seldom reached before May. In the autumn the females and young sometimes appear very early. Young birds are seen so early in the British Isles that it is hard to believe that they were not reared there, and I have shot them at Wenham, Massachusetts, in late September but this is exceptional. William Brewster (1924) found that there was some evidence of migration of young birds as early as mid-September at Lake Umbagog, Maine. The adult males, on the other hand, leave for the south very late, mostly waiting until everything is frozen. They can hardly be expected on the wintering grounds before late October or November and they continue to come in right up to Christmas, or perhaps even later.

GENERAL HABITS

It is a pleasure to write an account of a bird that is very much of an individualist, whose habits are distinct from those of most of the diving ducks and whose nearest relations are not too close. Shy, hardy, and for the most part distrustful of smaller waters, this restless bird is a true harbinger of winter. With us the first flight of Golden-eye always reminds us that the balmy days of autumn are numbered and that ice will soon be forming. Even after the young of the year and the females appear in late October it is a long time before the cold weather drives down many of the full-plumaged old males.

The Golden-eye is a deep-water duck preferring coastal waters, but common enough wherever there are large inland fresh waters or salt lakes that have plenty

of minute animal life. On migration they may stop almost anywhere but as a rule they avoid small ponds, enclosed marshes or shallow sloughs. They often like to use fresh-water basins near the coast at the same time as the nearby salt water. This is especially seen in our New England ponds in December and again as soon as the ice leaves in March or April.

In general shape this bird is quite different from any other duck except the Barrow's Golden-eye and the diminutive Buffle-head. The deep head contains in the frontal part near the bill two air chambers which are supposed to aid the bird in diving, but their function is not wholly clear. Two other smaller ones are lined with a sensitive mucous membrane and are associated with the olfactory apparatus.

Another peculiar characteristic is the large fusiform dilatation at the lower third of the wind-pipe in the males, a structure also seen in the Scoters and some other diving ducks.

One of the easiest of the diving ducks to identify either upon the water or in the air, the old male can scarcely be confused with any other bird except the Barrow's Golden-eye from which it is difficult to tell it except at close range (see under account of that species). The whistle of the wings often identifies this duck in all ages and plumages but sometimes this cannot be heard and then note must be made of the rapid wing-beats, short chunky head and white patch on the wings. The swimming position with the head well forward is very characteristic and this can be made out at long distances.

Wariness. Unlike most of the diving ducks this bird has the most acute sense of sight and hearing and is so well able to take care of itself that it needs little or no protection on its wintering grounds. Besides its wariness, which increases much with age and the advance of the season, it is so unsociable that it scarcely ever consorts with surface-feeders, or indeed with other diving ducks; nor is it at all gregarious. In certain favorite places it does at times decoy after a fashion of its own to a few well-made imitations of its kind but it pays little attention to live call-ducks nor will it usually follow up a string of wooden decoys pulled in toward shore on an endless line.

I do not know that any species shows more difference in wariness between the young and the old. Young groups (broods?) on their arrival from the north, and still more so single young ones, are distinctly stupid. I have oftentimes sculled up to such birds in floats or canoes on open lakes and shot them almost as easily as Ruddy Ducks. Single ones, too, show a distinct bump of curiosity and are likely to come in close to shore to investigate a flock of live call-ducks in front of a shooting-stand, but they usually depart very quickly and will not hang about among them as Scaup or Ruddies often do. I have had these young birds decoy to a "stand" of live ducks in the middle of the night once or twice. An instance of extraordinary tame-

ness was brought to my attention in November, 1922. I shot both barrels of a 12-gauge gun at a Black Duck from my "stand" while a flock of eleven Golden-eyes (immatures) was swimming not more than 150 yards away. Not one of them flew! Yet I have been astonished hundreds of times at the sagacity of old male birds in their instant response to such a noise as driving a tack with a hammer when they were so far off that I could hardly believe the sound was audible to them. All New England shooters know the difficulty of making a really good bag of Golden-eyes, for even where they are really numerous and their feeding grounds are much restricted by ice it is indeed seldom that we see more than ten or a dozen accounted for by a single shooter on one tide, but these, of course, are well-oriented birds on their regular wintering grounds. Their behavior when being approached by a punt in Ireland is well described by Payne-Gallwey (1882) who says that they are scarcely ever shot in this manner.

Abel Chapman (1889) tells how easy it may be to drive Golden-eyes toward a concealed shooter on lakes in northern England and he noticed that such birds (young in autumn) would continue to circle around a pond after they had been shot at and even to pitch among their defunct companions! He contrasted such individuals with the wily flocks that are absolutely unapproachable off the coast.

As Millais noted, Golden-eyes are singularly lacking in sagacity when "on feed" near shore (although old birds usually avoid a shore with cover) for considerable flocks often dive in unison, giving one plenty of time to run down upon them and take them when they rise. Although they make an extraordinary "get-away" the second they reach the surface, I never saw any evidence of their detecting a shooter's movements, no matter how rapid or noisy, while they were under water. An ability for detecting danger while under water has been accorded them by several writers, but I doubt any such faculty.

So long ago as 1653, Baldner, the "fowler of Strassbourg," remarked that "there are not so many as ducks [Mallards] catched, therefore they wax older and their meat is tough." In another place he enlarges on the difficulties in shooting them.

Daily Movements. One of the most, if not the most, restless of all ducks they seem like the Pintail to be continually on the move wherever they are found. Seldom does one see them resting comfortably and drifting about like Scaups, Red-heads or Ruddies. They are continually hurrying up and down channels all day long whether disturbed or not. Probably this excessive activity throughout the day is due to their being largely day-feeders. They are extremely timid about spending the night on inland lakes or enclosed waters and will almost always flight to the open ocean or a large bay just before dusk with clocklike regularity, coming back at day-break or often later. I have noticed this so often in our fresh waters near the coast that I am inclined to think it is almost a rule of the species sometimes broken, however,

by young flocks during autumn migration. Millais speaks of places on the coast of Great Britain where they stay at sea by day and come in to feed at night on brackish lagoons or fresh-water lakes. This is certainly contrary to my experience and that of many others (A. Chapman, 1889; etc.). For the rest, their day travels are governed largely by tides for they like to feed high up in salt-water creeks and estuaries during the flood, and over flats which at low tide are bare.

Gait, Swimming, Diving, Perching. One almost never sees these ducks on shore during the autumn and winter. If they do come to land it is on some isolated sandbar or edge of ice when danger seems remote. Their gait is extremely erect and waddling and they do not attempt to fly from land. In the breeding time they are at home amongst trees but even then they do not seem to perch often for they fly directly to and from the nest-hole and always enter it from the air. Merrikallis (quoted in Bull. British Ornith. Club, vol. 40, p. 152, 1920), however, says that in Lapland they are often seen perching on the artificial nesting boxes or on the limbs of spruce trees. Millais's remark that the females walk to the nesting place refers only to those (I should say wholly exceptional) cases where this duck lays its eggs on the ground. Audubon's account of the five Golden-eyes (?) that kept alighting in a sycamore tree over a ford in Kentucky is an experience which does not seem ever to have been repeated.

This bird has a rather typical swimming posture, with head stretched forward as if looking down into the water, a pose which often identifies it a very long way off. The coarse round head sometimes greatly puffed out and the high stubby bill are excellent field-marks when little else can be made out.

When "on feed" or alarmed and swimming away from a danger-point the body is deep in the water, the tail dragging or submerged and the bird ready for an instantaneous dive or jump. If in this position, they can and often do avoid shot at longish ranges by diving at the flash of a gun, but if shot at before they are warned of danger, and while swimming buoyantly, they cannot possibly escape a charge of shot with smokeless powder behind it.

I do not know of any observations that would give a correct idea of the maximum depth at which the Golden-eye can feed. Millais places it at eighteen to twenty feet which I should say is nearly correct while Eaton's (1910) estimate of "upward of thirty-five feet" would appear to be quite improbable. The greatest depth which Dewar (1924) found was thirteen feet. The most favorable waters are no doubt those between three and ten feet. The feeding birds disappear with a rapid push of the feet and go down at a steep angle or in circles, with the tail spread and the wings closed or nearly closed. Progress is by the feet alone, these being kicked out at a wide angle from the body; almost it would seem at a right angle. Progress under water was estimated at at least one foot per second (Alford, 1920), and time under water

averages $25\frac{1}{6}$ seconds at one to two fathoms depth. Harper timed some feeding in six or eight feet of water. The period under water averaged 21.4 seconds and the intervals 5.4 seconds. The maximum length of time under water seems to be 55 seconds (Alford) while various writers have timed dives of 40 to 50 seconds. The period above water as in other species is much shorter than that under water, say from 7 to 12 seconds, often much shorter than this, while in deep water it is, of course, longer. I quote Millais's description of under-water activities of a certain bird under a bridge. "It always proceeded to a depth of eight or ten feet of water and began to dive. On reaching the bottom it at once commenced to turn the stones over with the bill, and from under these various water insects were found or caught as they attempted to escape. Sometimes it would find a small batch of young fresh-water mussels, and these it would devour very quickly one after another, like a duck taking grain out of a pan. It never stayed under water more than a minute, even when finding food abundant in one spot, but came up, rested a moment or two and dived again. All food was swallowed where it was found, and small pebbles and fairly large stones were pushed over in the search. Several times I saw the bird just move a flat stone. It would go all around it and try it from every point."

As a rule these ducks come up almost exactly where they went down but I have seen flocks newly arrived cruising along with occasional exploratory dives which brought them up a long way from their previous position. Such flocks were probably not getting much food. I think nearly all food is swallowed before rising but no doubt an occasional tough bit is brought to the surface (as it often is with Scaup), readjusted in the bill, and rapidly bolted. A. Chapman (1889) has watched them "chewing" small fish before swallowing. In rising to the surface the body and feet seem to be held rigid and the bird bobs up with great speed by means of its buoyancy alone.

Diving is also used merely as a means of arriving quickly at a desired spot for food (an action seen in captive birds) or in order to alarm or disturb other species. It may also dive from the wing to escape raptorial birds, a habit I have never been lucky enough to see.

Flight. The "Whistler," as it is better known to American shooters, usually travels in small flocks wherever found and on the feeding grounds almost always splits up into little groups or even into singles and pairs. It is a noticeably unsociable fowl. In its evening and morning flights it is not so very rare to see a good number gather together in loosely formed flocks on their way out to sea and several writers have seen as many as 150 to 200 in one body. Millais says that the largest number he ever saw together was about 1000 (all adults) on the Moray Firth in northwestern Scotland. I cannot remember ever seeing such a large body which could be properly called a single flock.

Early autumn migrants appear in little bunches of four or five to eight or ten and the adults straggle along later in small lots, often as singles and twos and threes.

Griscom (1922–23) thinks that this species rises from the water as rapidly and steeply as a Black Duck (*Anas rubripes*). This is giving them just a little too much athletic ability. They can get away at a rather good angle if they are facing a strong breeze but the test comes, of course, in flat-calm weather when any one can see that they have to drag their feet and "spatter their wings" for a few yards at least.

The loud humming or whistling noise, which is heard best in still, frosty weather, is familiar to all. Naturalists may offer their various explanations as to the use or origin of this peculiar sound, but I do not think they come very near any adequate explanation. It is associated partly with sex, for the narrowed web on the last two primaries is a male characteristic. Mayhoff (1918) has paid particular attention to this wing-whistle of the Golden-eyes and he concludes that it is loudest in the male, much less, although present in old females and young males of the year, and absent in young females up to the first wing-moult. I have often noticed the difference in intensity of the wing-whistle and I certainly associated the loudest sounds with spring flocks on our ponds, perhaps because there is then a much larger proportion of old males. I doubt whether this sound has anything to do with courtship, or indeed with a special signalling apparatus such as has been suggested. Old males can be heard under the proper conditions for a mile or two, possibly more.

Association with other Species. This is an independent and very unsociable bird along our coasts. Writers have spoken of them as not associating with any other ducks and this is practically true. One sees them mixed with Scaup and Buffle-head during the winter, but never intimately, and such grouping seems purely accidental. On migration they stick closely to their own kind, or scorning company, strike out boldly for themselves. T. Pleske (1878) mentioned a Golden-eye nesting in the same tree which was occupied higher up by a Sea Eagle! Competition for good breeding hollows very frequently results in several females placing their eggs in the same nest. In Maine, the Hooded Merganser has used this duck's nest, mingling its eggs with the Golden-eye's (Brewster, 1900) and in northern Europe it is possible that the Smew may do the same thing occasionally.

Brewster (1924) noticed how at Lake Umbagog, Maine, the young broods broke up naturally very early in the season, even before they could fly so that a tendency to unsociability begins far sooner than in most ducks.

Voice. Although I have hundreds of times heard the female give vent to her unattractive harsh croak I never until recently heard the courtship note of the male, which is given only in the spring (see under Courtship and Nesting) and during active display. It was well described by Brewster (1911) as "a short flat vibrant

paaap not unlike that of the Woodcock but a trifle more prolonged and also less harsh and incisive." It is often double and reminded him somewhat of the blast of a penny-trumpet. Brüggemann (1876) and Gilpin (1880) seem to have been the first to notice this display call or "love note" as those more poetically inclined would probably term it. C. W. Townsend (1923) described it as a harsh and rasping double note vibrating and searching in character and expressed by the syllables *zzee-at.* On a calm day this note can be heard for half a mile over the still water but it is certainly often inaudible at a hundred yards, just as he says.

The croak of the female is so nearly like that of many diving ducks that it is hardly worth describing. I have jotted it down as a loud guttural *churr*-ing noise not often repeated. I have heard her give vent to a squeaking *ach* or *heck* uttered sharply on suddenly being surprised on the water with her young brood. Again the harsh note of alarm may sound like the *quaak* of a surface-feeder, very loud, but coarse and rough. Harper (MS.) heard a note like *cuk-cuk-cuk-cuk*, quite different from the ordinary grating *grrrk* when four or five females were circling through the woods hunting for nest-cavities.

The young at first have a little whistled "peeping" call but later a low chirping *prrrp* takes its place.

The trachea of the male is sufficiently remarkable and suggests some resemblance to that of the Mergansers. It was described by Willughby and Ray in 1678 and well portrayed by Latham and Romsey (1798) and by Eyton (1838). The trachea itself is nine inches long, the upper half of equal diameter throughout and small. At the commencement of the lower half there is an irregular fusiform dilatation four times the caliber of the upper part, and contractile. It consists of many joints placed obliquely and "folding over each other so as to admit of its being contracted into a very short compass, or dilated to a great distance, as the length of the neck may require." When fresh these rings may be folded into a space not more than an inch in length or drawn out to four inches.

The bony box at the bifurcation of the trachea is large and curiously shaped, somewhat like the same structure in the Mergansers.

Food. Although this is really a salt-water duck it gets along perfectly well on rivers and many large sheets of fresh water. From examinations by the U.S. Biological Survey of some 150 stomachs collected mostly in our northern States from November to April it is evident that the Golden-eye is highly carnivorous. Vegetable food is by no means avoided, sometimes even considerable of it is eaten, but in general it certainly makes up less than a tenth of the food of this bird. The plant material eaten includes seeds of a wide variety of shrubs, grasses, sedges, and other plants growing near water, as well as of the water plants themselves, such as water-lilies and pond-weeds. Musk-grass and other algæ are also given some preference.

The animal food is largely mollusks, crustaceans and insects. Both univalve and bivalve shellfish are consumed, and the Whistler feeds to a slight extent upon some of the commercial varieties, such as the scallop and the northwestern oyster. In fresh water, crayfishes, water beetles, snails, and the immature stages of two-winged flies, dragon-flies, may-flies, and caddis-flies are staple foods, and in salt water, crabs, barnacles, and periwinkles. A few small fishes are sometimes captured (W. L. McAtee, MS. notes).

To mention some of this food a little more in detail, it is well to note small fish and trout fry (O. W. Knight, 1908), salmon spawn on the Cumberland and Derwent Rivers in England, where this duck has been shot with spawn oozing from its bill (Thomas Hartley, in London Field, 1917, p. 152; also p. 226). In such places they are said to dig on the spawning beds with their feet and then drop down stream and eat the disturbed ova. (Barrow's Golden-eye also has been found guilty of eating salmon eggs in British Columbia.) Willett (1921) took some in March in southeastern Alaska which had herring spawn in their crops. Of shells and other aquatic animal food are mentioned *Lacuna vincta* and *Margarita helicina* in Maine (Norton, 1909); small crustaceans, as *Daphnia pulex* on the upper Rhine (W. and T. Heussler, 1896), shells of *Physa fontinalis* and water larvæ of *Neuroptera* (Cordeaux, 1896) and the broken shells of little clams, *Mya arenaria*, in San Pablo Bay, California (Grinnell, Bryant and Storer, 1918). Fatio (1904) gives a detailed list of the winter food in Switzerland and also mentions a few small fish (*Cottus gobio*). Unusual food, such as leeches in a fledgling in the month of July in Montenegro, was noticed by Reiser and von Führer (1896).

Insect larvæ (*Phryganeidæ*), fish, frogs and frog larvæ, shellfish and shrimplike animals of the genera *Palæmon* and *Crangon* are common according to Naumann. A detailed list of the food in Belfast Bay is given by W. Thompson (1851). Crayfish were found by Audubon in the stomachs of some shot near Henderson, Kentucky.

A habit of the Golden-eye sometimes observed, is to swim along with its head immersed looking beneath the surface preparatory to diving, just as we sometimes see grebes, loons and mergansers do. It can also get food without diving at all and one which W. Brewster watched for an hour feeding in shallow water simply by swimming about with its head under water was found later on dissection to be crammed full of water beetles.

A stomach which I got in autumn at Wenham, Massachusetts, contained 94 per cent vegetable matter and only 6 per cent animal matter: seeds of pond-weed, water-lily, bayberry, bur-reed, buds and roots of wild celery and bits of water-boatmen and dragon-fly nymphs. Even the seeds of *Zostera* (eel-grass) are sometimes eaten (Norton, 1909). Two stomachs collected in Alberta in June were more than three-fourths filled with vegetable matter, namely, the seeds of yellow water-lily and bur-reed, with a few of pond-weed, coontail, and milfoil. Their animal content was

larvæ of caddis-flies and predacious diving beetles (U.S. Biological Survey). Such food explains occasional good-tasting meat in autumn before the regular coarse winter diet begins.

Courtship and Nesting. One of the most beautiful sights of late winter or early spring is a flock of these striking birds going through their elaborate display antics in all their gorgeous dress (see Plate 69). This is perhaps the prettiest performance of any of the ducks and shows some affinity to the action of the Pochards and the Goosander. It was first described by Dr. F. Brüggemann (1876) from captive specimens. Later, Gilpin (1880) noticed it in Nova Scotia and more recently it has been studied carefully by C. W. Townsend (1910), Brewster (1911), Millais (1913), and Boase (1924). I have seen it many times at Wenham Lake in March and April and once on October 16 in a pair of adult birds, but this last, of course, was unusual. One is tempted to dwell a little on this activity of the Golden-eye, for it is very interesting and subject to a good deal of individual variation, but space forbids and I can only sketch its bare outlines. Brewster's paper is well worth reading.

The males, often in excess of the females, may be seen swimming about in an excited manner with their head-feathers very much puffed out, but often only one or two birds at a time (out of a considerable group) are in full show. At times the male swims with the head thrust well forward (the bowsprit pose of Brewster), dipping the bill in the water at intervals. This may or may not lead to the complete display, when the neck is stretched straight up, the bill pointing to the zenith and opened to emit the harsh, rasping double note described before under Voice. Then the head is quickly snapped back until the back of it touches the rump, where it rests for a small fraction of a second and is then snapped forward very quickly to the normal position. As the head comes back the bird often (but sometimes only once out of fifteen or twenty times) shoots itself forward by a rapid back kick of both its bright red legs, which results in a spurt of water showing behind the bird for a distance of several feet. This jet of water can be seen on a calm surface a long way off, but one often sees a good deal of display without the "kick" part. There are also other postures which are indulged in at this time and one of them does not seem to have been described. Once on April 11, I was watching a flock of nineteen Golden-eyes in "the cove" at Wenham Lake. All of these, except two males and a female, were diving and feeding, but these three were in especially active display. Besides the ordinary actions just portrayed I saw the males with head held stiffly forward (bowsprit pose) for a second or two, suddenly shoot *backward* for a distance of one or two feet. I cannot imagine how this was done for there was no way of observing the feet. But this curious action was repeated many times and I feel sure that it must have had some significance.

The female often goes through a mild bobbing of the head while all this is going on

and at times lies out flat on the water even though no actual mating takes place. Gerald Legge (in Millais, 1913) saw in captive females a good deal more than this. A certain old bird would suddenly throw up her head and neck until the bill was quite perpendicular, and at the same time gave her loud call. This bird also kicked the water with both feet (one after the other) but did not raise the water as high as the male. Lilford (1895) saw his captive females in display. These actions in the female must, I think, be very rare, perhaps not normal, but we know of similar imitative display of the female in other species of ducks. A curious hollow groaning note like *owhh* was heard from a female by Harper on the Athabasca, which seemed to stimulate the male to throw back his head on to his rump. Occasional rough and tumble fights are witnessed between males and there is more or less of competition on the breeding grounds. Actual mating has been observed as early as February 2 (Alford, 1920) but as a rule one sees little actual pairing during the whole month of April.

I have no account of the mating or nuptial flight in the Golden-eye and can only suppose that it must be absent, as it is in most (?) diving ducks.

The nesting season is not especially early in Europe, late April and May in Germany, from June 1 onward in northern Finland (A. Newton, 1907; S. A. Davies, 1905) and in Lapland and northern Russia all through June. They are certainly preceded by the Mallard as a rule.

They usually begin to lay in northern New England and New York in late May and continue through June according to the season. A record of hatching on June 8 at Umbagog Lake is given by Brewster. I have seen young at least two weeks old in Maine the first week in July. In North Dakota eggs have been found as early as May 30 (Bent, 1901–02) and in Saskatchewan during June. In the delta of the Athabasca a few must nest by May 25 for the first downy young were seen on June 29 by Harper (MS.), but early June is probably the average time for the first eggs.

On the Yukon, in Alaska, eggs have been taken June 18 (Baird, Brewer and Ridgway, 1884).

Although the typical site for a nest is fairly well up in the hollow of a dead tree, it appears that sometimes, perhaps when the usual places are not available, the eggs are laid rather carelessly on the ground. These cases, however, if they really do occur, are wholly exceptional (see Naumann, 1896–1905; Plathe, 1904).

In northern Europe the habits are exactly as they are here. They choose any opening in hollow trees such as those occupied by woodpeckers. Various species of trees especially birches with holes from twelve to twenty-five or thirty feet above ground, situated as a rule near or over the water are favorite places. Heights of fifty or sixty feet have been mentioned and at times they choose trees that are a good distance from the water. The actual nest-opening may be very small, a mere crack scarcely wide enough to admit the hand, say three inches by four and one-half (Bent, 1901–02), although those usually selected are a little larger. The nest may be on a

level with the opening or down to almost any depth, one being as far down as fifteen feet (Brewster, 1900). The nest is sometimes placed in openings in horizontal limbs (Seebohm, 1885) and one was found in a prostrate cotton-wood log in Canada (Spreadborough, in J. and J. M. Macoun, 1909). Harper (MS.) writes that in the Athabasca region the great balsam poplars that grow along the lower river are the nesting places *par excellence*. Aged white poplars (*Populus tremuloides*), canoe birches and others make good hollows for them, while in Maine such large hardwood trees as elms, maples, and yellow and white (canoe) birches are mentioned (Brewster). Lumbering operations that have flooded most of the shore lines of our larger eastern lakes, killing all the trees, have probably provided a very good, although temporary supply of nesting cavities.

A very odd site for a nest was described in a letter from F. L. Farley of Camrose, Alberta (U.S. Biological Survey field-notes). He found one in the blind chimney of a house in the town, where a pair had reared a brood for seven years. When hatched the young crept up the brick sides of the chimney and tumbled out on the roof.

Merrikallis (quoted in Bull. British Ornith. Club, vol. 40, p. 151, 1920) speaks of a nest found in a church in northern Finland.

We cannot go on to an account of the eggs without mentioning the custom of the natives of northern Finland (Lappmark) and the Swedish frontier of placing boxes on trees for the purpose of attracting these ducks as well as Goosanders and Smews. Needless to say the purpose is purely utilitarian for the eggs are much appreciated in these far-northern and henless regions, and by judicious collecting as many as twenty or thirty are taken from one box. This interesting custom was first mentioned by Linnæus in his "Tour of Lapland" in 1732 and a good first-hand account was written down by the collector, John Wolley, in 1853 (A. Newton, 1907). The boxes called by various local names are by preference on more or less isolated trees, frequently near houses and often back on the side of a hill away from water. The box is called "Fogel Tulle," "Tiller" or "Uu" in Finnish and "Hålk" in Swedish and the word at first referred (in some regions) to the roll of birch bark used as a float for fishing nets, indicating that the first "Tylly" was probably just a roll of bark. As now used these artificial cavities are made from a section of the trunk of a small hollow tree with a hole in it large enough to admit a man's hand and the box so constructed is hung on a peg with the owner's name indicated. It is said to be necessary to stuff all cracks with moss but it does not matter whether the inside is smooth or rough. It seems to be important to place the box in a conspicuous place and on no account should there be any branches to interfere with the bird's arrival and departure. The openings are made purposely very small.

With the progressive deforestation in Finland the Golden-eyes seem to be more and more dependent on these nest-boxes. Merrikallis (*loc. cit.*) says he has seen them fixed to a telephone pole ten meters from the farmhouse window.

The eggs of the Golden-eye are laid on the rotten wood or other material at the cavity bottom and down is added when the clutch is complete. Nests have been found with well-incubated eggs that had no down. The clutch is very variable, all the way from five or six to nineteen, with an average of around ten or twelve, but it is very hard to determine the usual clutch because two or more birds often lay in one nest. Brewster (1900) thinks that a nest which he found with nineteen eggs was the work of one female. As many as forty eggs have been credited to one female (Plathe, 1904). That such large numbers are apparently laid in the artificial nest-boxes in Finland does not seem improbable. The eggs are often packed solidly into the nest, arranged in two layers or set in end-down, so that it is difficult to see how the female can turn them. But turn them she must in some way or other or else they would not hatch properly. The eggs are bluish green, which fades soon to grayish green, and measure 59.19 by 42.55 mm. The greatest length is 67 mm. and the smallest is 52; the greatest width is 45 mm. and the smallest width, 39.4 mm. (Jourdain, in Hartert, 1920a). If there are ten to twelve eggs their weight is actually greater than that of the mother bird (Heinroth, 1922).

The down is pale grayish, smaller than that of the Goosander or Shelldrake and it is usual to see a tuft of this material sticking to the edge of the nest opening, which gives one a clue to the inhabitants.

The incubation period has not been satisfactorily defined. Blaauw's (1909) record of twenty days under a hen is probably too short, and Heinroth's estimate of thirty days, I should guess is somewhat too long. Naumann placed it at twenty-two days and Mr. A. Wolfe of Edmonton (*in litt.*) hatched some under a domestic duck in twenty-four days; under a bantam in twenty-eight days! This last seems to me the most likely period. I have heard of one record of over thirty days but I am not certain of the reliability of the observer. Reliable data show that the closely related Barrow's Golden-eye has a long period.

There remains to be mentioned a very unusual trait in this duck: the apparently tremendous competition which goes on around a favorite nest-hollow. It seems to be unusual to find a female that is left entirely alone and four or five birds may have an interest in one spot. Harper, who camped for several weeks close beside a nesting female on Egg Lake, Athabasca delta, was able to make some interesting observations. He noticed, as others have, the remarkably abrupt manner in which females enter the nest-hole, pausing a little outside to check their speed, but passing inside with scarcely any hesitation. But the peculiar thing about this place was the number of other females who came to visit the nest, sometimes four or five birds circling around it at one time and even fluttering before the opening while the rightful owner was incubating. Even a female Buffle-head paid a visit to it. Brewster saw the same sort of thing in Maine and concluded that more than one female took part in the incubation. However this may be, it is interesting that on the evening of the same day

after Harper's nest was vacated (July 11), two birds (a pair?) came to the nest and after that several birds were apparently laying in it, although he saw no full-plumaged (but possibly eclipse) males about. Competition then seems severe in many places but this is coupled with a certain amount of coöperation or a sort of communism that is entirely different from the parasitism usually encountered. It is still unexplained where these very late-nesting females find mates and manage (if they do) to lay fertile eggs. From his long experience with nesting Golden-eyes in Maine Mr. Brewster was inclined to think that the males are polygamous, which if true would account very well for the group-nesting of the females.

Reliable observers have seen the exit of the young and describe it as a veritable "pouring out" or "boiling out," the little ones landing a few feet from the base of the tree (eight or ten) whether it be on land or water. Those hatched during the late afternoon apparently stay in the nest until the next morning, when the female alights at the base of the tree, swims around it, clucking for a few turns, and then, stopping directly under the hole, gives a single loud *chuk* which is immediately responded to by the appearance of an avalanche of the little ones (Brewster, 1900; Harper, MS.; Merrikallis, quoted in Bull. British Ornith. Club, vol. 40, pp. 151–52).

Groups of young are very apt to join, as they do with Mergansers. Harper saw thirty-two, with only one visible female in attendance and these were obviously of at least two different ages. The Golden-eye certainly verges on communism in all its nesting activities.

The vitality of the young when first hatched has astonished those who have caught them. They easily climb up any sort of material, smooth or wet wood, or cloth, by a series of jumps, and they can leap from the ground or water to a height of eight to twelve inches by the power of their legs alone. When first released they swim off without any practice and one that Harper caught from the nest went under like a flash almost as soon as it felt the water. After an hour's separation from the rest of the brood this youngster appeared very shy of its mother and even started to swim away, but eventually joined its own family in a hesitating fashion.

The males leave the females at about the time when incubation commences and differ from most other ducks in that they all seem to depart in a body. Possibly they go north. At any rate eclipse males are extremely rare. Harper saw the last adult males in Athabasca Lake on June 9 and none after that until middle October! There is a mystery here as well as in Barrow's Golden-eye that needs explaining.

Status. An abundant duck, it holds its own extremely well and depends more on available trees for nesting than on protection accorded to it during the autumn and winter. It could easily be increased on its nesting grounds were proper nest-boxes provided. This subject was discussed by Lönnberg (1922) in a little pamphlet which I have been unable to obtain.

Its abundance as a nester in northern Finland is evident from the accounts of the early bird-collectors in that country who found places where a dozen or more nesting-boxes were hung up within sight of each other. Northeast of Berlin near Eberswald, Jäger (1910) tells of a regular breeding colony of fifty or sixty that occupied breeding hollows in old oak trees at Wolletz Lake. I do not doubt that colonies could be started almost anywhere within the regular breeding range, and probably even north of it as has been done in places in northern Finland where trees are too small (S. A. Davies, 1905).

The Golden-eye still holds out as a breeder in northern New England, apparently in nearly its original numbers, although the Hooded Merganser has vanished within a few years from the same region. Harper found it third in order of abundance among the breeding ducks of the Athabasca delta where it was extremely plentiful and seemingly limited only by the available hollow trees. It is considered seventh in order of abundance on Puget Sound in December (U.S. Biological Survey).

This duck is so evenly distributed along our Atlantic coast from the Gulf of St. Lawrence to Beaufort, North Carolina, that its total population must be enormous. I had always thought of it as fairly scarce south of Chesapeake Bay but it is present in thousands; in fact, scattered all over the surface of Pamlico and Core Sounds. In the larger rivers of New England adult birds winter way north to the upper Connecticut valley, and great numbers stay in most of the Great Lakes. The only thing, as far as can now be seen, that will impair their numbers is the scourge of oil along our coastal waters. Probably no species of duck in eastern North America suffers so little from persecution during the open season. If our better-class ducks yield from ten to twenty-two per cent of their numbers to the flesh-pot, as we know they do from the proportionate return of banded individuals, this one can hardly lose two per cent! Although this is a very common autumn migrant at Wenham Lake, in fact, about the third most abundant duck, it represents only five per cent of the total number of ducks shot in twenty-two years!

The numbers upon European shores are about the same as on our own and as far as I know they are holding out satisfactorily.

Enemies. Allan Brooks (1922a) has made a number of observations on the activities of the White-headed Eagle on the northern Pacific coast and has come to the conclusion that this bird was very destructive indeed to adult Golden-eyes as well as to many other ducks. When it is realized that on Queen Charlotte Islands there were at least four eagles to a mile of shore-line, and that at one point forty or fifty could be seen in a single day, we can see how much destruction is possible. Grebes, loons, gulls, coots, ducks, moulting Canada Geese and Sooty Grouse were among the victims.

Audubon, in the Ornithological Biography, says that he several times surprised

raccoons feeding on adults that they had presumably caught. No doubt pike in our northern lakes make away with a good number of downy young.

Damage. They take very few (only about 1 %) of scallops when feeding in Massachusetts waters which are stocked with this fine shellfish (U.S. Biological Survey notes).

Food Value. Little need be said except that the nearly complete animal diet renders the flesh decidedly strong. Still it is in a class superior to the Scoters, and very much better than the Long-tailed Duck or the Eiders. On Cape Cod, in Massachusetts, the natives always maintained that the "Whistler" was one of the best table ducks. They sent the Black Ducks to market (because they brought a high price) and extolled the low-priced and high-flavored "Whistler" as far superior. It should be added that this duck is almost always fat even in the depths of the hardest winter.

It is quite true also that the young birds before they have reached salt water in October are not really very strong, but somewhat dry and "sedgy." A number of writers, Frank Forester among them, speak of these young birds as often good. On the Chesapeake Bay, indeed, they have been ranked as equal to the Greater Scaup; which I may add is not saying a great deal in their favor.

Hunt. To make a bag of Golden-eyes in New England one usually has to go out prepared for this duck and no other. It is true that in some places they will be shot when one is rigged out for Scaup, Red-heads and other divers, but they usually avoid a large flock of "stool ducks." They decoy best on some little pass or channel, through which they are used to flying on the tides, and when they have not been much shot at, they will come warily, especially single birds, to a little flock of a dozen or so of wooden decoys. But it is seldom that a really large kill is made in this way and the shooter must be prepared to face long waits in the most exposed situations, sometimes in a hidden duck-float painted white in winter, but more often on a rocky point or a blind built of ice cakes near an open tideway. This last is perhaps the most effective method, for when you can find a small open hole which Golden-eyes are using, an ice blind and white clothing combined sometimes make a deadly combination. Nowadays, however, the operation of the Federal Law stops shooting after January 1 over most of the wintering ground so that the ice-hole shooting is a thing of the past. On Long Island Sound a peculiar boat called a "scooter" which is both an ice-boat and a sail-boat was at one time used a great deal for this air-hole shooting. These boats were painted white and were at home on either ice or water.

Of course a good many newly arrived flocks are shot more or less successfully (usually less) around ponds and rivers, sometimes by running down upon them when

they are diving near shore and sometimes by driving them past points. I can recommend the former method as an exciting form of sport, one which takes a sure foot and a quick eye, for there is not an instant to lose after the first bird pops up and starts away.

Few Golden-eyes are taken by punt-shooters in Europe, and fewer still (almost none) were enticed into decoy-pipes. They are far too wise a bird for this sort of contraption.

In North Germany a method of getting them by drop-nets operated from huts was described by Naumann (1896–1905). Some were also taken in horizontal nets spread under water along the coasts which entangled them while diving for food (MacPherson, 1897).

Behavior in Captivity. Although this duck has not been shown in collections of water-fowl nearly as often as it should have been, and is usually considered unfit for life in confinement, it nevertheless does rather well in certain places. Mr. H. Astley had a pair for eight years and Mr. St. Quintin kept one for four years. The adult males are said to be the hardest to keep but I cannot see why this should be. At Mr. Blaauw's estate in Holland I saw a pair in 1922 which were twelve years old and had already bred many times. Mr. Blaauw told me that he had no trouble with these ducks once they were established. In 1924 I saw a female on Mr. Wormald's ponds in Norfolk, England, that was caught adult in 1911, so she must have been at least fourteen years old, which may be the record. P. C. Mitchell (1911) mentions the average duration of life for twenty individuals as two years and nine months and he tells of one that lived to be thirteen years and eight months old! Rogeron apparently was not able to keep them at all, but I know that in several European gardens they have done well. I believe that nobody has succeeded in breeding them in England and they have never bred under fence in America.

An old note by Brüggemann (1876) who kept two pairs for several years gives a very good record of the activities of pinioned birds. Each male had a definite area of water in the pond and held it against other males. Their action toward a rival is peculiar. After swimming up in a threatening manner, sticking out the head horizontally, the bird dives, and swims rapidly under water until near his rival, but even under water neither bird invades the other's territory and they often turn around suddenly under water when they reach their limits. When two males meet on the boundary line they both dive, but when they appear again they are farther apart than before. Actual battles did not occur. Brüggemann was the first naturalist to describe the display and the spring call of the male.

Heinroth (1911) and Lilford (1895) have a good deal to say about the under-water attacks of their Golden-eyes and how they were able by their unexpected dives to scatter the other members of the pond, besides attacking each other. These threat-

ening dives are apparently characteristic of the Golden-eye and enable them to terrify all other species except the Smew.

Blaauw (1909) was perhaps the first to breed them in confinement. After keeping a pair for six or seven years the female was one May day seen frequenting some of the nesting-boxes set on poles in different parts of the pond, and in the latter half of the month two eggs were found in one box and three in another box. As she showed no disposition to incubate, being perhaps disturbed by the Carolina Ducks which laid in the same boxes, three of the eggs were placed under a hen and were duly hatched on the 26th of June. One of these young died the first day, but the two others were reared to maturity. These downy young were very tame and intelligent, living principally on ant larvæ and duck-weed. On July 18 feathers became visible on the shoulders, and by August 8 the birds were completely feathered on their bodies, although the flight feathers had just begun to grow. On the 25th of August they were able to fly (nearly nine weeks) and at that time they were practically full grown. Mr. Blaauw told me that the young which he reared in later years by letting the mother duck have her own eggs were very troublesome, and immediately scattered and got lost. They did not seem to care about staying with the old one.

Mr. Job found that those he hatched from wild-gathered eggs were very wild and restless and for the first few days gave a good deal of trouble by scaling fences, especially wooden posts.

They have been quoted at £2 to £3 a pair in England, but hand-reared stock is worth much more than that. The New York Gardens have bought them for as little as $6.00 each, but these, of course, were wild-caught birds, most likely cripples.

When once used to captive life these ducks will live on ordinary vegetable food (grains, etc.) but they require occasional small fish, shrimps or raw meat. Natural food like fresh-water mollusks would, of course, be preferable, but where many ducks are kept these soon become exhausted.

Hybrids. In the wild state the Golden-eye crosses most commonly with the Smew, and these hybrids have been described as *Mergus anatarius* (Eimbeck, 1831) and *Clangula mergoides* (Kjärbölling, 1853). In addition, wild hybrids between the Golden-eye and the following species have been taken: Goosander, Hooded Merganser, Velvet Scoter, Scaup and Common Pochard (Poll, 1911). Yarrell (1884–85) says that Geoffroy St. Hilaire described a cross between the Golden-eye and the American Carolina Duck!

In captivity a male Golden-eye and a female Tufted Duck have been successfully crossed and the offspring reared (Astley, 1921).

So far as I know there have never been any hybrids with Barrow's Golden-eye discovered.

GEOGRAPHICAL RACES

GOLDEN-EYE

BUCEPHALA CLANGULA CLANGULA (LINNÉ)

Anas clangula Linné, Systema Naturæ, ed. 10, vol. 1, p. 125, 1758.
Bucephala clangula G. R. Gray, Hand-list Genera Birds, vol. 3, p. 87, 1871.

CHARACTERS: Size smaller. Wing in males from 216–227 mm.; bill 33–36; tarsus 35–39.

RANGE: Northern regions of the Old World from Iceland and Scandinavia to China, Formosa, and Japan, casual at St. Paul's Island (?); (intergrading with the American form in the Pribilovs?).

AMERICAN GOLDEN-EYE

BUCEPHALA CLANGULA AMERICANA (BONAPARTE)

Clangula americana Bonaparte, Geogr. and Comp. List, p. 58, 1838.
Glaucionetta clangula americana Stejneger, Proc. U.S. Nat. Mus., vol. 8, p. 409, 1885.
Clangula clangula americana A.O.U. Checklist, ed. 3, p. 76, 1910.

CHARACTERS: Size larger, but overlapping in measurements with the smaller form so that not all individuals can be identified. Wing 220–232 mm.; bill 35–41; tarsus up to 41.

RANGE: North America.

BARROW'S GOLDEN-EYE

BUCEPHALA ISLANDICA (GMELIN)

(Plates 66, 68, 69)

SYNONYMY

Anas islandica Gmelin, Linné's Systema Naturæ, ed. 13, vol. 1, pt. 2, p. 541, 1789.

Anas clangula Faber (*nec* Linné), Prodromus Island. Ornith., p. 71, 1822.

Fuligula islandica Stephens, General Zoölogy, vol. 12, pt. 2, p. 192, 1824.

Clangula scapularis Brehm, Oken's Isis, p. 999, 1830.

Clangula barrovii Swainson and Richardson, Fauna Boreali-Amer., vol. 2, p. 456, pl. 70, 1831.

Fuligula (Clangula) barrovii Nuttall, Manual, vol. 2, p. 444, 1834.

Platypus barrowi Reinhardt, K. Dansk. Selskab. Naturvid. Afh., p. 103, 1838.

Fuligula clangula var., Audubon, Ornith. Biogr., vol. 5, p. 105, pl. 403, 1839.

Anas barrowii Temminck, Manual d'Ornith., ed. 2, vol. 4, p. 551, 1840.

Glaucion islandicum Keyserling and Blasius, Wirbelth. Europ., pp. lxxxvi, 229, 1840.

Clangula islandica Bonaparte, Cat. Met. Uccelli Europ., p. 74, 1842.

Bucephala islandica Baird, Birds No. Amer., p. 796, 1858.

Fuligula clangula, var. *islandica* Palmén, Journ. f. Ornith., vol. 24, p. 58, 1876.

Glaucionetta islandica Stejneger, Proc. U.S. Nat. Mus., vol. 8, p. 409, 1885.

VERNACULAR NAMES

English: Barrow's Golden-eye, Barrow's Duck, Rocky Mountain Golden-eye, Rocky Mountain Whistler, Rocky Mountain Garrot, Iceland Golden-eye, Iceland Duck, Arctic Garrot.

German: Spatelente, Grosse Schellente, Isländische Schellente, Barrows Ente, Arktische Schellente.

French: Bucéphale d'Islande, Garrot islandais, Fuligule de Barrow, Garrot arctique.

Dutch: Barrows Dykand.

Icelandic: Husönd.

Norwegian: Islandsk Kvinand, Barrovs-and, Husand.

Danish: Islandsk Hvinand.

Swedish: Islands-knipa, Barrows knipa.

Finnish: Islannin telkkä.

Greenland Eskimos: Niakortok, Kaertlutorpiarsuk, Analortalik, Avolortulik.

Labrador Eskimos: Katjitok, Katjituk, Katjitut, Uviloktut.

DESCRIPTION

ADULT MALE: Very similar to the Common Golden-eye, but distinguished by the crescentic white patch at the base of the bill instead of the round patch, and by the purple, instead of the dark green gloss of the whole head. The white area on the lower neck, upper mantle, breast, and abdomen are just as in the Common Golden-eye. The lower mantle, rump and tail are also similar. The scapulars and upper wing-coverts present characteristic differences. In Barrow's Golden-eye there is a great deal more black than white, and white areas are confined to an irregular streak along the outer scapulars, a small patch on the median wing-coverts and the speculum-patch, which last consists of the tips of the greater coverts, as well as of most of the secondaries. The outer scapulars are peculiar in shape, being bifid at the tip, with the black external web longer than the rest.

Iris bright golden yellow. Bill bluish or brownish black. Legs and feet yellow, more brilliant in spring (paler than in Common Golden-eye).

Wing 232–248 mm. (American examples seem to average about 235 mm.); bill 31–36 (American examples may be a trifle smaller); tarsus 42.

Weight: same as Common Golden-eye.

ADULT FEMALE: Similar to the female of the Common Golden-eye and only to be distinguished in life by its smaller and more chrome-yellow bill. But this last is not infallible, for after the breeding season the bill becomes dusky (July). Also the shape as well as the size must be examined. The head-color is usually somewhat darker (deep sepia or purplish snuff-color) and there is a little more gray on the upper breast. None of these color characters can be wholly relied upon, and this sex must be considered as only identifiable by bill measurements. The diagnostic points as given by A. Brooks (1920) are quoted below in full.

Barrow's Golden-eye	*Common Golden-eye (American race)*
Nail: Arched in both longitudinal and transverse sections, showing a conspicuous hump above the contour of the bill.	*Nail:* Flattened or depressed. Not conspicuously raised above the contour of the bill when viewed from the side, and not arched in its transverse section toward base.
Length of nail: ♂, over 0.46 in., longest 0.53, shortest 0.48, average 0.508; ♀, over 0.40, longest 0.46, shortest 0.41, average 0.43.	*Length of nail:* ♂, less than 0.46 in., longest 0.44, shortest 0.38, average 0.406; ♀, less than 0.40, average 0.37.
Shape of bill: Conspicuously tapered, width taken at a point through anterior angle of nostril, ♂, less than 0.69, widest 0.68, narrowest 0.63, average 0.65; ♀, less than 0.60, widest 0.59, narrowest 0.55, average 0.57.	*Shape of bill:* Not conspicuously tapered when viewed from above. Width at a point through anterior angle of nostril, ♂, over 0.69, widest 0.82, narrowest 0.70, average 0.74; ♀, over 0.60, average 0.69.
Shape of skull: Frontals conspicuously bulging in adult males, hardly less so in immature males of second year, bulge distinctly noticeable to the touch in adult females, and faintly so in young (?) females.	*Shape of skull:* Frontals continuing the slope of culmen, without trace of a bulge.

Iris yellow to straw-color. Bill orange or cheese-color except the nail, which is black; sometimes dusky toward base of bill (bright colors lost in summer, regained in autumn). Tarsus same as in Common Golden-eye, yellow to orange-yellow.

Wing 205–224 mm. (American specimens rarely above 215); bill 28–31; tarsus 39.

IMMATURE STAGES: Appear to be exactly the same as in the Common Golden-eye; males of the season do not approach maturity until March or April and never complete their plumage the first year. The bills of females are at first all dark brown or dusky. The birds probably do not breed the first spring.

YOUNG IN DOWN: Same as that of the Golden-eye except in colors of soft parts. In this species the bill is pale black to lead-black; toward the tip blackish flesh-color; nail reddish gray. Feet, greenish gray to dirty greenish yellow while those of the Common Golden-eye are yellowish with gray-black webs (Millais; Hantzsch, 1905).

DISTRIBUTION

BARROW'S Golden-eye is one of the more uncommon American species, the details of whose distribution are still very imperfectly known. The difficulty of distinguishing it, especially the females and young, from the Common Golden-eye, makes it appear even rarer than it really is.

BREEDING RANGE

ACTUAL satisfactory breeding records for this species are very rare, yet they must be particularly emphasized in determining the range, because the males take long flights after the female has begun to sit and their presence in mid-summer is by no means acceptable evidence of the species' nesting in the locality. The duck is not rare in summer as far north as the Kuskokwim and Yukon Rivers, Alaska. About the base of the Alaska Peninsula, Osgood (1904) found it fairly common, yet for the whole of Alaska there are only four definite breeding records, namely: Lake Clark, Chilcat, Chichakov Island and Sitka (Nelson, 1887; U.S. Biological Survey).

Alaska

In northern Canada the Barrow's Golden-eye has been taken (undoubtedly non-breeding or summer wanderers) as far north as Fort Anderson (R. MacFarlane, 1908), Fort Providence and Fort Rae (Preble, 1908). In British Columbia specimens were seen in the Stikine River region in June (Swarth, 1922) and these were probably breeding birds, for this Golden-eye has been found nesting about Hazelton and in the Babine Mountains (E. A. Preble, U.S. Biological Survey). Farther south in British Columbia the species nests commonly, especially in the Cariboo Mountains, at Lake La Hache and in the Okanagan Valley (Fannin, 1891; A. Brooks, 1903, 1920; Munro, 1918). Mr. William Rowan of the University of Alberta at Edmonton, writes me that in May, 1923, he saw some Barrow's Golden-eyes for the first time in that vicinity. The species, however, nests in southwestern Alberta, at Banff (Raine, 1892) and along the east base of the Rocky Mountains, north, at least, to Smoky River Lake.

Northern Canada

British Columbia

Alberta

In our western States this Golden-eye is said to occur in summer throughout the interior of Washington, though no nests have actually been found (W. L. Dawson and Bowles, 1909), but in Oregon nests have been taken on Paulina and Diamond Lakes (Cooke, 1906; U.S. Biological Survey). It also breeds in northwestern Montana, particularly in Glacier National Park (F. M. Bailey, 1918; A. A. Saunders, 1921), while in Wyoming it is known to nest commonly, particularly in and about Yellowstone National Park (Grave and Walker, 1913; U.S. Biological Survey). The southern limit of the breeding range is in Colorado, where nests have been found as far south as Dolores County (Brewer, 1879; Morrison, 1888a).

Western States

Farther east specimens have been taken on Lake Manitoba, Shoal Lake and at the mouth of the Red River, Manitoba (E. E. Thompson, 1891) but these were unquestionably summer stragglers. Similar casuals have been seen or taken at Montreal and Quebec (U.S. Biological Survey). Wintle (1896) tells of finding a nest at Missisquoi Bay, Lake Champlain, Vermont, but this undoubtedly refers to the Common Golden-eye, as also the breeding records of Merriam (1882) for Point des Monts, of Comeau (1909) for Godbout, and of Schmitt (1904) for Anticosti. But summer specimens have been taken on Prince Edward Island and on the Labrador coast at the Eskimo River and at Okak (U.S. Biological Survey). L. M. Turner (MS.) says the species occurs all along the Labrador coast in summer and records a specimen taken on Davis Inlet in July. It seems to me that there must be some locality in northern Labrador where the species nests, for otherwise it is practically impossible to account for the numbers that have been recorded from the North Atlantic coast. Hantzsch (1908) says he found the species a "not rare" breeding bird near Killinek on Ungava Bay. He shot a female and young of the year still retaining down among the feathers, on August 30. It certainly seems likely that this Golden-eye breeds in the Ungava region.

Manitoba

Labrador

MAP 92. Distribution of Barrow's Golden-eye (*Bucephala islandica*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

In Greenland this species is confined to the west coast, where it is resident, breeding from Julianehaab (perhaps even Nanortalik) north to Godthaab or even Sukkertoppen and Holstenborg (Holböll, 1846; Reinhardt, 1861; Schiöler, Deichmann, in Millais, 1913). In Iceland, too, it is a resident bird, breeding chiefly on the Myvatn, but also in various other localities (Slater, 1901; Hantzsch, 1905; Millais, 1913; *et al.*). Greenland Iceland

Winter Range

In winter Barrow's Golden-eye is found regularly as far north as southern Alaska (Portage Bay), where it is common (Hartlaub, 1883; Willett, 1921; Bailey, MS.). On the coast of British Columbia and Vancouver it is only moderately common (Kermode, 1904; Taverner, 1917; A. Brooks, *in litt.*), though on the coasts of Washington it is said to be common (W. L. Dawson and Bowles, 1909), and in Oregon it is fairly abundant about Fort Klamath (J. C. Merrill, 1888). In California it is a rare bird, most of the specimens coming from San Francisco Bay and none having ever been taken south of that point (Grinnell, Bryant and Storer, 1918). Alaska British Columbia Western States

In the interior a few winter in Montana (A. A. Saunders, 1921), many in Idaho (J. C. Merrill, 1897), Wyoming (Grave and Walker, 1913), Utah (Henshaw, *fide* Baird, Brewer and Ridgway, 1884; specimens in U.S. National Museum) and Colorado (Felger, 1909; L. J. Hersey and Rockwell, 1909; Bergtold, 1924). It has been taken as late as December 1 in Kansas (Bunker, 1913; H. Harris, 1919) and is said to occur rarely in winter in Missouri (Widmann, 1907), Nebraska (Bruner, Wolcott and Swenk, 1905) and Iowa (R. M. Anderson, 1907). It undoubtedly is found also in Minnesota about Lake Superior (Hatch, 1892) and in Wisconsin along Lake Michigan (Kumlien and Hollister, 1903). It is rare in Illinois (Ridgway, 1895; Woodruff, 1907), in Indiana (A. W. Butler, 1898), in Michigan (Barrows, 1912) and in Ohio (L. Jones, 1903). According to McIlwraith (1894) it has been known to winter on the Ontario side of Lake Huron. It does so rarely in western New York (Elliot, 1898; Eaton, 1901) and no doubt along the St. Lawrence, for it winters on the north coast of the Gulf (Merriam, 1882; C. W. Townsend and Allen, 1907; C. W. Townsend and Bent, 1910; Comeau, 1909) and on Anticosti (Schmitt, 1904). Specimens have been taken on Prince Edward Island (MacSwain, 1908) and Nova Scotia (Downs, 1888), while in New Brunswick it is not uncommon (Chamberlain, 1882). Along the entire coast of New England it is occasionally found in winter (G. M. Allen, 1909; *et al.*) occurring very rarely in the interior of Maine (O. W. Knight, 1908) and even Vermont (W. P. Smith, 1921). Farther south it is nothing but a straggler, one specimen having been reported from the Potomac River, Virginia (Richmond, 1891) and one very doubtful record being listed for North Carolina (T. G. Pearson, C. S. and H. H. Brimley, 1919). Interior Atlantic Coast

As aforesaid, the species is resident and very local in Greenland (Holböll, 1846; Schiöler, in Millais, 1913; etc.) and Iceland (Hantzsch, 1905). Though the majority seem to seek the southern coasts of Iceland in winter, Millais (1913) has shown that it is fairly well distributed even at that season. Greenland Iceland

Sporadic Occurrences

From Iceland this species undoubtedly visits western Europe. Hantzsch (1905) speaks of specimens taken on the Faroes, and two were taken on the Shetlands on March 13, 1913 (Ford-Lindsay, 1913). None of various records for the British Isles is satisfactory (Millais, 1913; Witherby *et al.*, 1919–22). In Norway specimens were taken by Schrader in 1848 and 1851 on Varangerfjord (Pässler, 1853). Fallon's (*fide* Dresser, 1871–81) statement that it occurs in Belgium is inconclusive and we are not in a position to examine properly the French records for Calvados, 1843 (Lesauvage, *fide* Ternier and Masse, 1907), for Lille, 1829, 1834, and for Bergues (Norquet, *fide* Paris, 1907). In Spain a young

male was taken on December 22, 1871, near Valencia (H. Saunders, 1877) and another is said to have been shot in Cataluña (Vayreda, *fide* Arévalo y Baca, 1887).

Migration

This duck is in some places local in its habits, only performing journeys to the nearest coast where it settles down for the winter. The birds that nest in Alaska seem to winter in the same region. Those breeding in British Columbia go down to the coasts in the cold season, while some of the nesting birds of the Rocky Mountains are found in the open waters of the same section during winter. In the East the same conditions probably apply, for the nesting (?) birds of northern Labrador and perhaps West Greenland are found scattered along our North Atlantic coast as far south as Cape Cod.

We do not yet know where the males go after leaving the breeding females in the mountain region of our West. Like the Common Golden-eye this is a late migrant, not appearing on the coast of southeastern Alaska until well on toward the end of October, while some remain late into May.

GENERAL HABITS

The existence of this duck is a fact of a good deal of general interest to any one who cares to speculate upon the curious freaks of parallelism in Nature. Here we have a bird so close in general appearance to the Common Golden-eye that even to-day few ornithologists are able offhand to separate the females and the young. Only the full-plumaged males are identified in the field with certainty and this leads one to hazard a guess that the species may be far more common on our North Atlantic coast than we think. Suppose, for example, that few of the old males (relatively speaking) come down to our eastern coast, and that the young of the year go farther south than the old ones, it may well be that this is a fairly common winter visitor, for not one out of a hundred in female plumage shot by the ordinary shore-gunner would receive a second look. The very best ornithologists (Brewster, Baird, and others) have identified specimens wrongly and both Wilson and Audubon overlooked the species entirely, or regarded it as a curious variety of the Common Golden-eye. Indeed, the marked anatomical differences were not pointed out until J. Bernard Gilpin, a Nova Scotia naturalist, described the trachea in 1878 (Gilpin, 1878).

The noteworthy facts regarding the bird are chiefly as follows. First, its remarkable distribution, breeding in Iceland, as an isolated colony, in southwestern Greenland and probably in Ungava. Beyond that in a westerly direction we know nothing about it until we get to the mountain region of western Canada which seems to be its chief breeding home in North America. However, it may well be that further knowledge will fill in many gaps in the region north of Hudson Bay.

The appearance of the duck is truly remarkable, for, in spite of the fact that it has a very differently shaped skull, a trachea without the great dilatation, and a smaller tracheal bulb, the superficial resemblance to the true Golden-eye is extreme.

It may as well be admitted by our at times somewhat over-enthusiastic opera-glass field observers that the female or young cannot be identified with certainty.

This is the case in autumn or winter, but on the breeding grounds, where the two kinds almost never mingle, it is a different matter.

From the somewhat sketchy nature of our information on this duck it seems that the intimate traits are very similar to those of the Golden-eye save only the breeding habits. The voice is the same as far as the female is concerned but the spring call of the male has not often been heard, and it seems likely from what Allan Brooks has told me that it is a much less powerful sound, for he has difficulty in hearing it, as do others who have had an opportunity to watch these ducks before the nesting season.

The wing-whistle is like that of the true Golden-eye, but not so loud (Riemschneider, 1896; Millais, 1913) and the flight is just the same.

Association with other Species. Wherever found in winter on the Atlantic coast this duck is mixed in with Common Golden-eyes, but almost never in the company of other ducks. On its breeding grounds, of course, the Common Golden-eye seldom if ever occurs. In Iceland, on Lake Myvatn, where large numbers nest in holes in the rocks, their eggs are not infrequently mixed with those of the Red-breasted Merganser (Hantzsch, 1905). One nest described by Shepard (in Baird, Brewer, and Ridgway, 1884) contained four eggs of this species which were being incubated by a female Merganser.

Food. The Rocky Mountain Golden-eye lives on fresh- or salt-water mollusks and crustaceans and is very fond of small crayfish which lurk under large stones in shallow water. While hunting these they work rapidly along the shore, diving every few minutes to probe under the edges of the large stones. The crayfish are brought to the surface to be swallowed, but this is not so with the small shellfish. By the end of winter the feathers on the forehead are generally worn off through rubbing against the stones while foraging for crayfish (Munro, 1918). The same observer (Munro, 1923) found that in November on Henderson Lake, Vancouver Island, these ducks ate a large number of sock-eye salmon eggs. They came during daylight hours and fed along sandy bottoms where immense numbers of salmon were depositing their eggs. Out of twenty birds shot and examined, all, or at least all that had had time to feed, contained salmon eggs; in one case as many as three hundred.

A single stomach from Barr, Colorado, contained some musk-melon seeds and oats, evidently waste material, a fly larva and several earthworms. One examined by Dr. Bernard Gilpin of Nova Scotia was filled with marine univalves of four species (Forest and Stream, vol. 10, no. 5, p. 75, March 7, 1878). The indications are that the food is similar to that of the American Golden-eye.

Courtship and Nesting. This Golden-eye selects deep, clear lakes during the nesting season, the same sort of places where the Red-breasted Mergansers are seen,

and they have a strong liking for alkaline lakes, even if there is little aquatic vegetation. By the 15th of April in their favorite grounds in the interior of British Columbia each little lake, says Munro (1918), has its flock of courting Golden-eyes, often forty or fifty on a sheet of water of fifty acres' extent or less. Part of these flocks (about half) are immatures, and small flocks of young females are seen throughout the summer on lakes where there are no old females with broods. It is easy to tell the young (or perhaps non-breeders) because their bills are only partly orange whereas the paired birds have a nearly uniform orange bill. The non-breeders are continually being chased away by the males and there seem to be many more females than males.

The display (Plate 69) is very much like that just described in the Common Golden-eye, and has been recorded as well as figured by Allan Brooks (1920). The principal difference is that the whole performance in the Barrow's is less exaggerated and the male does not throw the head nearly so far back. The common form of display in the male is the swallowing or gulping action with the bill open and pointed straight up or over the middle of the back; never with the head on the rump. This may or may not be followed by the kick which throws the water up behind. Chasing, with the head close to or level with the water, and the body sunk, always occurs when one male invades another's territory. The pursuer often dives and comes up under the intruder who then makes off at great speed. The males preen themselves a great deal between periods of display. The only call in this sex (so Major Brooks tells me) is a grating croak and a faint grating or clucking sound given during the gulping posture.

The latest displays which Brooks ever saw were on May 20, 1921, long after most of the adult, as well as immature males had left.

The female sometimes takes part in the display, bobbing her head up and down or from side to side while croaking. At other times she is indifferent, and goes to sleep alongside the posturing male with her head buried in her feathers and her tail cocked up at an angle.

In central British Columbia breeding birds are mated and scattered over the country by the first of May. The earliest date for full clutches in that region seems to be May 12, but as early as May 22 downy young were seen (at Okanagan) according to Munro (1918). In Iceland the eggs are laid in the end of May or the first part of June. In cases where the nests are robbed by natives, eggs are laid until the end of June or even the middle of July. During the breeding season in Iceland these birds become extraordinarily tame, allowing approach to within a few yards, and if alarmed swimming away rather than taking wing. This tameness is characteristic of the breeding season only (Riemschneider, 1896; Hantzsch, 1905; Millais, 1913), and the same sort of thing is seen in our own West. But this does not apply to birds

in late autumn, where either in the interior or on the coast they become about as wild as the Common Golden-eyes.

In the Rocky Mountain district this Golden-eye nests only in elevated regions, sometimes as high as 10,000 feet in Colorado (W. L. Sclater, 1912). The site chosen is always an opening in a dead tree or the top of a hollow stub. One described by A. Brooks (1903) in what was probably the deserted nest of a flying squirrel in a Douglas fir, was fifty feet from the ground. This tree was four hundred yards from the water, but most nest sites are far lower down and much nearer the water, in general very similar to the sort of places chosen by the Common Golden-eye. An unusual situation for an American nest was the hay-loft of a deserted log barn on the shore of a lake in the Okanagan region. The eggs were placed in a hollow scooped in the straw under a heavy beam which rested on the piled-up straw. This situation had apparently been used for some time, for in previous years the old birds had been seen alighting on the top of a chimney of an unused house close by (Munro, 1918).

The entrance to the nest cavity may be as small as four inches in diameter. Allan Brooks writes me that he has found several instances of cracked eggs of both this species and the Buffle-head. In his opinion the eggs were actually cracked in the oviduct owing to the compression of the body of the female in entering the nest-hole. A cracked egg, with the cracks "sealed over," has also been found in the nest of a Carolina Duck.

In Iceland where there are no suitable trees the natural sites are always holes in the rock, crevices in the lava islands in the lakes being particularly well suited. Sometimes these holes are very deep with narrow openings, and on occasion the nest has been found at some height above the water. Usually, however, it is but slightly above the water level and in close proximity to it. Nests on the open ground under bushes, as mentioned by Faber, if they occur at all, must be very exceptional. Due to protection, these Icelandic Golden-eyes have become very familiar, and do not hesitate to make their nests in curious places, such as turf walls of huts, sheep-shelters or stables. At times they have even been known to take advantage of mangers or semi-dark corners of stables, using the door as an entrance (Krüper, 1857; Riemschneider, 1896; Slater, 1901; Hantzsch, 1905; Millais, 1913).

Actual nest sites in Greenland or Ungava have not been described, but it is reasonable to suppose that there, too, they must occupy fissures in the rocks.

When breeding in trees no material other than down is used to make the nest, but when under rocks a little grass and vegetation is used as a pad for the eggs.

So far as known the clutch is the same as in the Common Golden-eye, averaging perhaps eight to ten and reaching a maximum of fourteen or fifteen. In Iceland, at least, two or more birds not infrequently lay in the same hole, and since the nests are regularly plundered it is often difficult to calculate the number of eggs laid by any one bird. The eggs are similar in color and shape to those of the Common Golden-

eye, perhaps somewhat larger and harder-shelled. The average dimensions of one hundred eggs (Jourdain, in Hartert, 1920a) were 61.8 by 44.8 mm., the maximum and minimum lengths being 68 and 57.6 mm., and the maximum and minimum widths 47 and 42.1 mm. The nest-down cannot be distinguished from that of the Common Golden-eye.

The incubation period is not absolutely known; Hantzsch's (1905) "about four weeks" is probably nearly right. In 1923 Mr. Wormald received a setting of eggs from Iceland which must have been from three to three and a half weeks old when he got them in Norfolk, England. He set them under a hen on June 27 and they hatched (five of them) on July 28 making a period of thirty-one days, which is long, even for eggs in rather poor condition.

In our western mountain country the males, curiously enough, suddenly vanish entirely from the breeding area, as soon as the females begin to incubate. Ordinarily by the middle of May they, as well as the immature non-breeding males, disappear at the same time and Allan Brooks has told me that since he has been observing this habit, May 28 was the last date on which he saw an adult male at Okanagan. The same phenomenon has been noted in the case of the Common Golden-eye and also in the Buffle-head. No one seems to have found out certainly where these summer excursions lead, although Brooks thinks they may go directly to the coast. But the fact remains that no corresponding abundance of males has ever been observed on the coast of Alaska before the middle of October (Bailey, MS.). Possibly they go north.

It is very hard to explain why in Iceland no such summer migration takes place. Indeed, Hantzsch says he has seen groups of males, numbering several hundred, on the Myvatn Lake close to the nesting places as late as the end of July. The species is more nearly sedentary in Iceland than it is with us.

Status. We, in eastern North America, look on the bird as a very rare duck, but this, of course, is not true of the species as a whole, for all through its mountain home it is remarkably abundant. At times during winter they are even more abundant than the Common Golden-eye on the coast of southeastern Alaska (A. M. Bailey, MS.; Willett, 1921). There is no reason to suppose that they are not holding their own satisfactorily.

The actual status in northern Labrador is not yet worked out, nor do we know certainly where our Atlantic coast birds come from. It may be that they are merely stragglers from West Greenland and that the Ungava breeding colony may after all be merely a myth.

It is again quite possible that there are many more females and immatures of this Golden-eye wintering from the Gulf of St. Lawrence to Cape Cod in Massachusetts than we think there are. Adult males, although rare, are found among large bodies of Golden-eyes almost anywhere north from Cape Cod. It is only a question of how

hard one wants to look for them. I do not doubt that one out of every four or five hundred of the common sort may belong to this species. The small numbers brought in as specimens mean nothing, for few native shooters know anything about this duck, and now that our markets are closed, the bird men get no chance to look over the spoils of the shore shooters.

In Iceland the bird is extremely abundant and its eggs have such a high value that it is protected, and its nest systematically robbed. Strange to say this practice does not seem to have any ill effects on this or other species.

ENEMIES. In Iceland Richardson's Skua is undoubtedly the chief enemy. A Falcon (*Falco rusticolus islandus*) kills a few adult birds of all the diving ducks. The large White-tailed Eagle in that region does not seem able to catch healthy adults, but lives on fish and possibly on crippled ducks unable to fly (Millais, 1913). Hantzsch (1905) says the Iceland birds are much pestered by large swift lice and by leeches. No doubt on the coast of southern Alaska the White-headed Eagle preys on this as on other species of ducks during the winter.

DAMAGE. On the coast of British Columbia there is no doubt that this duck is destructive to salmon eggs on the spawning grounds in late autumn (see under Food).

FOOD VALUE. The flesh is not different from that of the Common Golden-eye; on fresh water and in early autumn they may be of fair flavor. The eggs are much prized by the Icelanders and, like those of the Common Golden-eye in other places, are spoken of as "very tasty," bringing a higher price than the eggs of any other Iceland duck.

HUNT. The few specimens that are taken on the North Atlantic coast are killed over decoys by shore shooters who are after Common Golden-eye.

BEHAVIOR IN CAPTIVITY. H. A. MacPherson (1894) appears to have been the first to attempt the rearing of these birds. His efforts met with complete failure. Mr. St. Quintin told me that he once succeeded in rearing one or two from eggs imported from Iceland and that he presented them to the London Gardens. In the spring of 1923 Mr. Hugh Wormald hatched five out of a setting of eggs gathered from wild birds in Iceland. He reared four, all drakes, and he told me that they gave him very little trouble; he fed them a good deal of chopped liver. Two of the four he kept, but the other two escaped. The next spring he was even more successful and I saw some newly hatched young on a visit to his place in late July, 1924.

HYBRIDS. No hybrids have ever been recorded. It is doubtful whether crosses with the Common Golden-eye could be distinguished, excepting possibly in the male sex with the aid of anatomical investigation.

BUFFLE-HEAD

BUCEPHALA ALBEOLA (LINNÉ)

(Plates 67, 68, 69)

SYNONYMY

Anas albeola Linné, Systema Naturæ, ed. 10, vol. 1, p. 124, 1758.
Anas bucephala Linné, Systema Naturæ, ed. 12, vol. 1, p. 200, 1766.
Anas rustica Linné, Systema Naturæ, ed. 12, vol. 1, p. 201, 1766.
Clangula albeola Stephens, General Zoölogy, vol. 12, pt. 2, p. 184, 1824.
Fuligula albeola Bonaparte, Ann. Lyceum Nat. Hist. New York, vol. 2, p. 394, 1826.
Platypus albeola Reinhardt, K. Danske Vid. Selsk. Afhdl., vol. 7, p. 104, 1838.
Clangula bucephala Lichtenstein, Nomenclator Avium, p. 102, 1854.
Bucephala albeola Baird, Birds No. Amer., p. 797, 1858.
Charitonetta albeola Stejneger, Bull. U.S. Nat. Mus., no. 29, p. 166, 1885.

VERNACULAR NAMES

English: Buffle-head, Butter-ball, Butter Duck, Butter-back, Butter-box, Butter-bowl, Spirit Duck, Conjuring Duck, Dipper, Robin Dipper, Bumble-bee Dipper, Dapper, Dopper, Die-dipper, Didapper, Wool-head, Scotch Duck, Scotch Dipper, Scotch Teal, Shot-bag, Hell Diver, Sleepy Diver, Buffalo-headed Duck, Marionette, Little Black-and-white, Little Brown Duck.

German: Büffel-Ente, Kleine Schellente.

French: Petit bucéphale, Marionnette, Sarcelle de la Louisiane, La Religieuse, Sarcelle blanche et noire, Petit canard à grosse tête, Sarcelle de la Caroline, Garrot albéole.

Spanish: Pato de la Carolina.

DESCRIPTION

ADULT MALE: Whole head and upper neck dark metallic green and purple, except a large patch of pure white on the side of the head posterior to the eye, that joins its fellow of the opposite side at the occiput. Lower neck white, as well as the whole of the under parts. Mantle, inner scapulars, back and rump black, shading into pearl gray on the upper tail-coverts and tail. Outer scapulars white, tipped with black. Wings black around carpal joint, outer coverts and outer secondaries and primaries, but a large white patch covers all the central coverts and most of the secondaries. Under wing-coverts blackish, more or less tipped with white; axillars black.

Iris dark brown. Bill bluish, darker at the base where it is nearly black. Legs and feet, pale pinkish salmon-color, the webs and joints dusky; but in spring becoming much more brilliant, at least to dull coral-red.

Wing 166–177 mm.; bill 27–30; tarsus 32.

Weight 15 ounces to 1 pound, 3 ounces (0.42 to 0.54 kilograms).

LONG-TAILED DUCK

Male (Summer)

Female

Male (Winter)

BUFFLE-HEAD

Male

Female

ADULT FEMALE: General appearance like a miniature Golden-eye, but there is a broad white streak or patch on the face and ear-coverts. There is no white collar as in the Golden-eye. The mantle and scapulars are dark slaty brown and the back and rump are black. Upper tail-coverts and tail blackish. Upper breast and sides of breast pale gray, like the sides, flanks, and under tail-coverts. Rest of lower surface pure white. Wing black except a small white speculum on the outer web of four middle secondaries. After the breeding season females become very worn and faded, almost white on the throat and lower neck and dirty brownish gray on upper side.

Iris brown. Bill dark plumbeous. Legs and feet pinkish gray to bluish gray.

Wing 151–160 mm.; bill 24–27; tarsus 31.

Weight 15 ounces to 1 pound, 2 ounces (0.42 to 0.51 kilograms).

FEMALE IN FIRST (JUVENAL) PLUMAGE: Almost exactly like the adult female, but somewhat paler and more grayish on the chin and throat and with the edges of the white face-patch not so clearly defined. Blunted tips to the tail-feathers are not such good characters for immaturity as in the surface-feeding ducks and many other diving ducks.

Weight of immature specimens in November is 10 to 14 ounces (0.28 to 0.39 kilograms).

MALE IN FIRST (JUVENAL) PLUMAGE: Not always to be distinguished from the young female except by the larger size. White face-patch somewhat broader, and occiput usually darker and richer in color.

IMMATURE MALE: There is a long interval during which the male of the year undergoes little change, just as there is in the Golden-eye. From October to January or February most young males may be easily mistaken for females. During the first spring, March to May, there is a partial assumption of adult plumage, but apparently this is never complete until December of the second year, that is, at about eighteen months of age. Young males coming out of their first eclipse (second autumn) can easily be distinguished from fully adult males at the same season of the year by their incomplete white wing-patches on the middle coverts. It is very doubtful whether males breed until their second year.

MALE IN ECLIPSE: A male, evidently an old bird, shot by F. Harper at the Athabasca delta on July 10, 1920, shows what must be a nearly perfect summer plumage, a stage rarely seen in collections. This is only superficially like the adult female but a little later in the season the resemblance might be closer. The occiput is black, and there are still purple feathers on it and on the front part of the face. The white face-patch is larger and duskier than in the female and the lower neck is pale gray. There is no white on the hind neck and mantle, all of which region is very ragged and dirty gray in color. The scapulars, back and rump have not yet moulted but are worn and lighter than in full dress. The rump is darker gray than in winter and the tail is worn to reddish brown instead of gray. The sides and flanks are gray as in the female, although perhaps a little darker, and the upper breast is like that of the female. None of the wing-feathers has yet been moulted and the coverts are just as in full winter dress.

Iris dark brown. Culmen, nail and gular sac olive-black; lower mandible very dull plumbeous. Tarsus, brownish flesh-color on outer side, and pale flesh-color on inner side. Testes small.

I do not know the average time at which old males get back into winter-spring dress, but some have been seen in the North in nearly complete plumage by late September. Probably mid-October would be nearer the normal time.

YOUNG IN DOWN: I cannot see any difference between the young of this species and the Golden-eye except, of course, that at similar ages the Golden-eye is much the larger. Millais speaks of a difference in the shape of the white patch on the "sides" but I fail to detect any in the very large series now before me.

DISTRIBUTION

The Buffle-head is a North American species with a distribution very much like that of the Common Golden-eye in the New World. It breeds almost exclusively in Canada and Alaska, and during the winter is widely distributed through the United States.

Breeding Range

Alaska

In Alaska this duck is found only in the central and southern parts. It is rare at the mouth of the Yukon (Nelson, 1887), though stray specimens have been taken on the Pribilovs (G. D. Hanna, 1916). But in the interior of Alaska, especially on the upper Yukon and Kuskokwim and about the mouth of the Porcupine River it is common (Nelson, 1887; Dall and Bannister, 1869; Lockhart, Kennicott, *fide* Baird, Brewer and Ridgway, 1884; Dice, 1920). Loring (1902) reports it common about Cook Inlet, also. Its exact breeding range in Alaska is not well worked out.

Northwestern Canada

In northwestern Canada the breeding range extends throughout the MacKenzie basin to its mouth (Preble, 1908; R. MacFarlane, 1908) but it cannot be said to nest in any numbers north of Great Slave Lake. In this region nests have been taken at Fort Simpson, Fort Rae, Fort Resolution (*fide* Baird, Brewer and Ridgway, 1884). Along the Great Slave River and about Lake Athabasca, as well as along the lower reaches of the Athabasca River, lies one of the centers of abundance in the breeding season. Preble (1908), R. MacFarlane (1908), Seton (1911), Harper (MS.), and many other naturalists and explorers found it abundant and nesting in the wooded areas in this region.

British Columbia

It is an abundant nesting bird in British Columbia, too, according to Fannin (1891), A. Brooks (1903), Kermode (1904) and Taverner (1919c). The same is true of Alberta. Loring (*fide* Preble, 1908) found the species common on the lakes between Edmonton, Jasper House, Henry House and the Smoky River. Soper (1918) speaks of it as occasionally seen near Edmonton though Stansell (1909) found it a very common nester in central Alberta, and W. S. Brooks and Cobb (1911) state that it is a fairly common breeder in east-central Alberta. C. B. Horsbrugh (1915) and Taverner (1919b) found it nesting rather commonly about Buffalo Lake and the Red Deer River. There are very few records of its having actually been found nesting in Saskatchewan. At Quill Lake, Ferry (1910) saw small numbers that were apparently nesting, and Raine (1892) states that it was found doing so at Rush Lake, in the southwest. According to E. E. Thompson's (1891) correspondents the species is a common summer resident and breeding bird in various parts of Manitoba, and Raine (1892) says he has eggs from Long and Oak Lakes in the same province. Farther north in Keewatin the species probably nests in many localities. R. MacFarlane (1908) speaks of it as not scarce about Cumberland House and English River, and Preble (1902) met with it along the Red River and Hill River. He adds that other explorers have found it on the Severn, at Severn House, Moose Factory, Trout Lake and Fort Churchill. Saunders (*fide* McIlwraith, 1894) is said to have found some nesting as far south as St. Clair Flats, Ontario.

Alberta

Saskatchewan

Manitoba

Keewatin

Ontario

United States

In the United States a few Buffle-heads have been found nesting in northern Montana (A. A. Saunders, 1921), in Wyoming (Grave and Walker, 1913; Cary, 1917), formerly in northern Iowa (Cooke, 1906; R. M. Anderson, 1907) and once in Wisconsin (Kumlien and Hollister, 1903). Small numbers are said to pass the summer in the mountains of Washington (W. L. Dawson and Bowles, 1909), and J. A. Allen (1909) speaks of it as a nesting bird on Klamath Lake, on what authority I do not know. Very recently evidence, not wholly convincing, has been published to show that Buffle-heads nested on Eagle Lake, Lassen County, northern California (J. Dixon, 1921; M. S. Ray, 1921; A. Brooks, 1922; Labarthe, 1922). Proofs of its nesting in Minnesota (Stark, in Dresser, 1871–81) and in North Dakota are also inadequate. Both Chamberlain (1882) and Boardman (1903) speak of it as a breeding bird in New Brunswick, but there are no good records of actual nests taken. There are non-breeding summer

Maritime Provinces

MAP 93. Distribution of Buffle-head (*Bucephala albeola*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

records for Saranac Lake (New York), for Maine, where I have seen it myself, for Quebec, for Digby and Halifax (Nova Scotia), for Prince Edward Island and for Godbout on the south Labrador coast (U.S. Biological Survey).

Winter Range

In winter the Buffle-head is found regularly on the Aleutian Islands (Nelson, 1887; L. M. Turner, 1886). Indeed specimens have been taken in January on the Commander Islands, off the Kamchatkan coast (Stejneger, 1885), as well as on the Pribilovs (G. D. Hanna, 1916). Hartlaub (1883) has recorded it from Portage Bay, Alaska, in December and January, and Littlejohn (U.S. Biological Survey) found it plentiful at Sanakh, while in southeast Alaska it is said to be abundant in the cold season (Willett, 1921; Bailey, MS.). It is found in equally large numbers along the coasts of British Columbia and Vancouver (Fannin, 1891; Kermode, 1904; Taverner, 1917) and thence southward throughout Washington (W. L. Dawson and Bowles, 1909; Rathbun, 1915), Oregon (J. C. Merrill, 1888; Jewett, 1914) and California (Grinnell, Bryant and Storer, 1918). Occasionally specimens have straggled to Oahu, Maui and Laysan in the Hawaiian group (Bryan, 1901; Schauinsland, 1899; R. C. L. Perkins, 1903).

Aleutians
Alaska
British Columbia
Pacific Coast
Hawaii

In the interior, specimens have been known to winter as far north as Okanagan Lake, British Columbia (Munro, 1923), Teton County, Montana (A. A. Saunders, 1921), and more commonly in Idaho (J. C. Merrill, 1897), Wyoming (Grave and Walker, 1913), Nevada (Hoffman, 1881), Utah (*fide* Cooke, 1906), Colorado (Felger, 1909; W. L. Sclater, 1912; Bergtold, 1924) and Arizona (Swarth, 1914). In Texas it is probably a rare bird in the interior (Strecker, 1912), though in the southeast and presumably along the coasts it is common enough (Dresser, 1866; Nehrling, 1882; Carroll, 1900).

Interior

It is abundant on the Louisiana coasts (McIlhenny, 1897; Beyer, Allison and Kopman, 1907) and smaller numbers winter in Alabama (Howell, U.S. Biological Survey), in Arkansas (Howell, 1911), Kentucky (Pindar, 1889), Illinois (Ridgway, 1895), Indiana (A. W. Butler, 1898), Michigan (Barrows, 1912), Ohio (W. L. Dawson, 1903) and occasionally New York (Eaton, 1910). On December 27, 1920, a specimen was noted as far north as Bowmanville, Ontario (M. G. Gould, 1921).

Gulf Coast
Mississippi Basin
Great Lakes

On the Atlantic coast the Buffle-head winters as far north as New Brunswick (Chamberlain, 1882; Dresser, 1871–81) and Nova Scotia (Downs, 1888; H. Lloyd, 1923). It is found in small numbers all along the New England coast (G. M. Allen, 1909; etc., etc.), in the Great Lakes region sparingly, in southern New York (Eaton, 1910), New Jersey (W. Stone, 1909), Delaware (Rhoads and Pennock, 1905) and more commonly in Maryland (Kirkwood, 1895), Virginia (Rives, 1890), North Carolina (T. G. Pearson, C. S. and H. H. Brimley, 1919) and South Carolina (Wayne, 1910). But at Mulberry Plantation, Oakley, South Carolina, Mr. C. Chapman has taken only six out of large numbers of ducks shot in the years 1916–23. Scott (1888, 1892) found it rare on the Gulf coast of Florida, and farther south on the Caloosahatchie Islands, but it winters rarely on the Alabama coast at Mobile Bay and Grand Bay (A. H. Howell, U.S. Biological Survey). Off the coast, the Buffle-head has been taken in Bermuda (J. M. Jones, 1859; S. G. Reid, 1884), once in the Havana Market (Gundlach, 1875) and once at San Juan, Porto Rico (Wetmore, 1916).

Atlantic Coast

In Mexico, Berlandier (*fide* Baird, Brewer and Ridgway, 1884) met with this species in Tamaulipas and Kennerly (*ibid.*) saw great numbers in Chihuahua. It has been recorded also from northern Lower California (Cooke, 1906) and from Mazatlan on the west coast (G. N. Lawrence, 1874). The southernmost records are for Guanajuato and the Valle de Mexico (Dugés, 1869; Villada, 1891–92) and for La Barca, near Lake Japala, Jalisco (U.S. Biological Survey).

Mexico

Stragglers

The Buffle-head has been taken in Greenland near Gothaab (Reinhardt, 1861) and apparently also near Frederickshaab and Godhaven (*fide* Cooke, 1906). It has been many times recorded from the

British Isles, but only three records seem to be authentic, as follows: one near Yarmouth, Norfolk, about 1830; one at Bridlington, Yorkshire, winter 1864–65; one at Tresco, Scilly Islands, January 17, 1920 (Millais, 1913; Witherby *et al.*, 1919–22). The occasional captures in the Hawaiian Islands have already been noticed.

Migration

The migration dates for the Buffle-head are very much like those for the Common Golden-eye, and do not require special comment. Like most northern breeding ducks they do not move very early in spring. The bulk passes over the inland States, particularly those of the Mississippi basin, during March. Southern Canada is traversed in April, and the northern nesting areas are reached in May. In autumn they linger until driven out by frost. Few appear on the wintering grounds before late October, and the majority do not arrive until well into November.

Just as with the Golden-eye, the early migration of the young birds is a marked feature. I think from my own experience that there is even more difference in the time that the sexes move than with that species. At Wenham, Massachusetts, the small lots of immature or single birds begin to appear between the 19th and 25th of October (earliest October 9), but they are most common in November. Adult males are always remarkably rare and pass mostly in December, rarely stopping in the ponds. Mr. F. S. Hersey, who watched the Boston markets carefully in 1909, 1911 and 1912, noticed no old males until December. The earliest date of their appearance was December 4 and the latest December 22.

In southeastern Alaska, Bailey (MS.) saw the first autumn migrants at Young's Bay on October 7, but they were not abundant till October 24.

The distribution of the sexes in winter is less plain. There is often an excess of males in New England waters in late winter (four or five to one), but then I think I have seen a great many males as far south as Cape Hatteras. Of course it is difficult to estimate the relative abundance of the sexes, for the males are so showy and the females and young so easily overlooked, that one gets a false impression.

Banding Experiments

A female banded by Mr. Burtch of Branchport, New York, on April 6, 1922, was recaptured on April 17 near Collingwood, Ontario, on Georgian Bay (U.S. Biological Survey). Its first capture was by a "set line" and its second by a herring net, in whose meshes it became entangled and drowned.

GENERAL HABITS

This, the smallest of the sea ducks, occupies a niche more or less by itself, but is nevertheless plainly related to both the Golden-eyes not only by its general conformation, plumage and habits, but by the appearance of its downy young.

Generally speaking this is a fresh-water duck during the nesting season and a coastal one throughout the winter, but in suitable large lakes or rivers, or in fact on any open water, it sometimes winters. Almost as light in the air as a Teal and as quick as its larger cousins at getting under water, perhaps even quicker, this busy, restless little bird is always flying about, more or less oblivious to what other creatures, man included, are doing. It, too, is the harbinger of winter, appearing in our New England ponds along with the Golden-eye and Hooded Mergansers and other "hard-weather" fowl.

DOWNY YOUNG

(Upper) BUFFLE-HEAD (Middle) GOLDEN-EYE (Lower) BARROW'S GOLDEN-EYE

Wariness. Stupid by nature in spite of its quickness and vivacity, this duck has a curious habit of coming back many times and flying around a pond or marsh pool from which it has many times been disturbed, and where it may constantly have heard the sound of guns. If it is shot at on the water without warning it will almost always dive, and its quickness in diving response has given it many local names. In former days, as many older writers noticed, the boy with the flint-lock or even with the percussion-cap gun was no match for them at all, and the Indians of our coast thought of them as bearing a charmed life and called them "Spirit Ducks." Now, of course, since the speeding-up of powder and shot, as well as everything else in this anxious world, the reaction time of the Buffle-head is far too slow to save it on the water. If it were not for its poor flesh, small size, and the broad waters of its wintering grounds it would long ago have been greatly depleted. But many sportsmen spare it, as they should, preferring to save their ammunition for more valuable game.

Although so tame and confiding at almost any time of year, Harper (MS.) noticed that the young of both this and the Golden-eye tend to remain in open water in the face of danger, instead of betaking themselves to the cover of the marsh as most of the other ducklings of the Athabasca region did.

It is provided, too, with an exaggerated bump of curiosity, and single birds or little families will nearly always come near shore to investigate a flock of Mallard decoy ducks.

Daily Movements. The Buffle-head's restless behavior marks it as a day-feeder. It puts its trust in larger bodies of water during the night, and when on migration it comes to our lakes somewhat late in the morning, like the Golden-eyes, and very seldom at the first streak of dawn. It seems to have a strong aversion to a strange lake, unless it can see what it is about.

Gait and Posture. It is seldom indeed that one sees Buffle-heads on shore. Occasionally they "haul out" on the edge of the ice, standing in an erect and upright position. Toward spring I have sometimes seen them standing on a point of marsh left bare by the tide. Nearly all the diving ducks, especially Scaup, Golden-eyes and even Eiders, crawl out of the water more often in late winter and spring than they do on first arriving from the north in autumn. Perhaps this is partly due to their being less disturbed in spring, but partly, too, I think it has some connection with the onset of the breeding instinct and the associated preening habits.

The posture in swimming is very similar to that of the Golden-eyes. In fact, on a misty morning when distances are hard to estimate and objects loom large, I find myself continually mistaking these little ducks for their much larger relatives. Like the Golden-eyes they are fond of turning over on their sides and scratching their heads with their feet. Often they turn almost completely over on their backs while

preening the feathers of the lower parts. These preening postures become more frequent in the spring, as they probably do in all the ducks, and some of them, it has been suggested, may be connected with the down-plucking and nest-building stimulus.

The old males in their showy winter dress give the impression of floating very lightly on the water, more so than the females, but doubtless this is merely an optical effect. It is easy, as I said before, to mistake females and young for Golden-eyes at long ranges, but the white head-streak and small size (especially as compared with other ducks) will usually tell the tale.

Diving. They dive with grebe-like speed and rely on this method of avoiding danger more often than do the Golden-eyes. Sometimes it suits their fancy to make a little jump before turning head foremost into the water, perhaps in this way saving themselves an extra push with their feet. So far as I can remember they seldom feed except in waters of moderate depth, three or four to ten or a dozen feet being best suited to their needs. Alford (1920) who timed them on the Pacific coast, found that in about a fathom of water the dives averaged from twenty-one to twenty-six seconds in length. The longest lasted only twenty-nine seconds and the shortest fourteen, while the period between dives was five to eight seconds in duration. C. W. Townsend's (1916) observations in Charles River Basin at Boston and in the Lynn Bay showed even shorter dives, from fourteen to twenty seconds.

The wings in healthy birds are not used as a means of propulsion under water, as has been stated by some writers. Wounded birds will of course use any method of escaping.

Flight. Like Teal, Buffle-heads fly low and in irregular little flocks, alighting daintily on the water and leaving it in a manner very cleanly cut for a diving duck. No doubt their speed when on the wing has been greatly overestimated, for some have thought them faster fliers than the Golden-eye. A couple, whose progress was noted along the route of the Baltimore & Ohio Railroad, were rapidly overtaken by an express train and their actual speed estimated at not over thirty-six miles an hour (H. L. Clark, 1893).

Family parties on migration most frequently consist of two or three to six or eight individuals, and seldom exceed a dozen in number. On the feeding grounds in winter they break up and scatter all over the bays or sounds, exactly in the manner of Golden-eyes. Scarcely ever do they congregate in large packs. There is no wing-whistle corresponding to that heard in the Golden-eyes.

Association with other Species. The Buffle-head is fully as independent as the Golden-eyes and seldom mixes with other ducks during migration. On the Atlantic coast they scatter out among great rafts of Scaup, little groups of Golden-eyes

and perhaps a few Scoters or Long-tailed Ducks, but they never really associate closely with any of these. I have a good many times seen single birds with Hooded Mergansers on autumn migration, for both species make their main flights at almost identical periods.

On the breeding grounds careful observations made for me by Mr. Francis Harper in the spring of 1920 showed that there was a marked competition between the Buffle-head and the Golden-eye in the search for nest cavities. Indeed, a young Golden-eye in down, collected on June 29, was being mothered by a female Buffle-head, which suggests that even the broods become mixed either before or after hatching.

"On July 2," writes Mr. Harper (MS.), "while watching the activity of several Golden-eyes about a nest tree at our camp on the Rivière Coupée (Athabasca region) I noticed four or five female Buffle-heads behaving in very much the same way on the opposite side of the river. They circled about over the river and also rested on the water near shore. Every once in a while a bird would fly into one of the large trees on the bank and flutter about it, and others would flutter around nearby trees. . . . On July 8 a female Buffle-head followed a female Golden-eye in fluttering before an already occupied nest of the latter species in a tree at our camp, and when the Golden-eye alighted on the river the Buffle-head promptly plumped down beside it." Harper thought there was a good deal of contention between the two species as well as between individuals of the same species, for good nesting-holes.

Voice. The notes of this duck are merely feeble imitations of its louder-voiced relative, the Golden-eye. I never have heard the little squeaky call of the male, which must, I think, be very rarely uttered, like the Golden-eye's, in the spring only. The female has at least two distinct calls, but even these are rarely heard, as the species is exceptionally silent. The ordinary note is the guttural *grrrk*, *grrrk*, a croak like the Golden-eye's, but much feebler. An entirely different note, which Harper often heard when the females were flying about looking for nest-holes, was more like *kuk-kuk-kuk-kuk*, similar to the Golden-eye's under like conditions. The ordinary call, mentioned above, is modified in various ways when used in piloting the young, or as a danger signal.

The trachea presents no peculiarities. It is somewhat flattened and about 4½ inches (114 mm.) long. The tracheal box is rather simple in form, flattened, and not markedly left-sided. On the dorsal aspect there are membranous windows separated by a central keel and on the ventral surface the bronchi are united by a strong bony ridge.

Food. The strong-tasting flesh of this species, as of the Golden-eye, indicates a predominance of animal food, both in summer and in winter. Nevertheless about one third of the diet is vegetable.

Some 60 stomachs have thus far been examined by the U.S. Biological Survey. Though relatively few, these were collected at points throughout the ordinary winter range of the bird. No material representing the summer food was available. The most important elements of the vegetable food are the seeds and foliage of bushy (*Naias*) and other (*Potamogeton*) pond-weeds. Winter buds of sago pond-weed and wild celery also are eaten, as well as seeds and foliage of widgeon-grass, eel-grass and coontail. To a lesser extent seeds of wild rice, smart-weeds, bulrushes, and various sedges are consumed. Of the animal food mollusks and the immature stages of aquatic insects are most important. Both univalves and bivalves are eaten, and among the insects dragon-fly and may-fly nymphs, caddis larvæ, fly larvæ, and water beetles and bugs. Shrimps, crabs, and other crustaceans, and a few barnacles are obtained by birds sojourning in salt water, and small fishes are not infrequently captured (W. L. McAtee, MS. notes).

The work of Audubon, of C. B. Horsbrugh (1915) and of Alford (1921) add little or nothing to the above summary. Very small fish, mentioned by several writers, as well as fish spawn, may be taken on occasion. A bird taken on St. Paul's Island May 19 had nothing in its stomach but caddis larvæ and their cases. Another one taken at the end of January had ground-up amphipods 80%, small bivalves 18%, besides a bit of a barnacle (Preble, 1923).

Courtship and Nesting. Buffle-heads reach their breeding area in Alaska during the last days in April and soon after almost every small lake in the upper Kuskokwim basin is pre-empted by a pair of them (Dice, 1920). In the Athabasca region a pair was seen on May 1 and breeding birds were well established by the middle or latter part of the month.

Although the character of the display was first indicated by Elliot (1898) and the pugnacious tendencies of the males were noted by Alexander Wilson, the courtship was first described in detail by C. W. Townsend (1916). It is noticeably different from that of either of the Golden-eyes. The prominent features are the short flights of the males. They rise easily, fly low over the water for a very short distance, then check their speed, and with down-bent wings and heads well up alight tail first with a good deal of a splash. Besides these flights and intervals of diving and preening, the ardent male suddenly "spreads and cocks his tail, puffs out the feathers of his head and cheeks, extends his bill straight out in front close to the water and every now and then throws it back with a bob, in a sort of reverse bow." The males continually chase each other and particularly fend off the yearling males, who, even at that date, are in immature plumage.

The laying season is not especially early. In central British Columbia the first eggs were taken on May 21 and May 22, while in one case downy young were found on May 16. The usual time for young to appear is toward the end of June. In the

DISPLAY ATTITUDES

(Upper) BARROW'S GOLDEN-EYE (Middle) BUFFLE-HEAD (Lower) GOLDEN-EYE

vicinity of Fort Resolution eggs have been taken on May 19 and on the upper Yukon on May 8 (U.S. Biological Survey; Baird, Brewer and Ridgway, 1884). About the Athabasca delta Harper (MS.) saw the first young on June 29, but they were not plentiful until a good deal later, about the middle of July.

The typical nesting site is the hole of the Golden-winged or Red-shafted Woodpecker at moderate heights (five to twenty feet) in any hollow tree. The entrance to these holes may be surprisingly small and is usually less than three and one fourth inches in diameter (A. Brooks, 1903); one nest opening was only $3\frac{1}{8}$ inches in diameter (Brooks, *in litt.*). One or two observers have spoken of nests in burrows in banks or on the ground. Possibly these do occur in treeless areas, but at any rate they are very exceptional. It is well to remember that in placing artificial boxes for any of our tree-nesting ducks the cavity should be only just large enough to admit the female. The boxes ought to be rather deep, too, and by no means should they have ventilation holes in the back, as I think some people have recommended. These hole-nesting ducks like an absolutely dark spot to incubate in when they can get it.

Out of many clutches which Allan Brooks has taken in British Columbia he collected several eggs which he believes were cracked in the oviduct of the females as they entered or left an opening a little too small for them. Similar cracks have been found in eggs of Barrow's Golden-eye and the Carolina Duck.

The clutch varies in size from five or six to ten, but it is so common for several birds to compete for one site and to take care of each other's young that it is very hard to strike an average. A. Brooks (1903) puts the average at eight. He describes the eggs as old ivory in color, without any tinge of green. They average 50.5 by 36.5 mm., the maximum and minimum lengths being 55 and 44.5, and the maximum and minimum widths 38 and 33.5 (Grinnell, Bryant and Storer, 1918; Hartert, 1920a). The nest-down is similar to that of the Golden-eye, of a dirty white color. The female is a very close sitter. Brooks tells of their sitting on the eggs till the hole was sawed out. In most cases, he said, "I had to lift the bird and throw her up in the air, when she would make a bee-line for the nearest lake, where her mate would be slowly swimming up and down unconscious of the violation of his home."

I do not think the incubation period has been accurately determined. Mr. D. H. Bendick of Leduc, Alberta, has written to me about his experiences in rearing these ducks from wild-gathered eggs and he says that he has hatched them (under hens) in twenty-one and twenty-two days.

The male probably stays about near the nest rather longer than in some other species. At least he is often seen near the nest while the female is incubating. However, he takes no interest in the brood and is never seen with them. The number of young with a female is very irregular, from two to nine, and once Harper found a female with only one young which proved to be a downy Golden-eye!

On July 15, Harper wrote, "I found a female with nine downy young ones in a

typical situation: an open space in a marshy lake. Such a brood furnishes one of the most charming sights in the duckling world. The old bird led them along the edge of the open water, but more often directed them in front of her, remaining several yards nearer than they to the advancing canoe, in order to shield them from danger. All the while she called *grrk* in a low tone, ducking her head slightly at each note. Several photographs of the family were taken at a distance of forty to fifty feet. Sometimes, when the canoe began to head them off, the old bird held back and called to the young in a way that seemed to mean 'about face,' for they turned then and went in the opposite direction. Sometimes, when pressed too closely, and apparently at the old bird's behest, they skittered over the water. During the action their wings were evidently kept at their sides, the feet alone propelling them along on their bellies, like animated toboggans. Meanwhile the female acted more or less the same, pushing speedily over the surface without the use of her wings. The brood did not take to the adjoining marsh at all."

Males band together as early as July first and in some places leave the region altogether. Such evidently is the case in central British Columbia. Very likely, however, they only require a proper cover and a feeding ground in which to go through their moult, for Harper found old males in eclipse in the Athabasca region, at least up to mid-July, and collected one for me. On July 14 he noticed a flock of fourteen males in various stages of eclipse plumage and at other times saw smaller groups, occasionally mixed with non-breeding (?) females.

Status. This is rather difficult to estimate, for the Buffle-head is not a "sporting" duck. Let me take New England first. Forbush (1912) noted a decrease of this duck in Massachusetts waters from correspondence with many people. In these cases we would like to know more than the bare fact of decrease, if possible a guess at the actual amount of decrease over a given period. My twenty-two years of records at Wenham Lake deal almost entirely with transient autumn migrants, most of them females and young. Between 1899 and 1922 there is a decrease of around thirty or forty per cent. During the last two or three years there has been a slight indication (too soon to talk about) of a recovery. It is here an uncommon duck and not always shot at, but its presence is always noted on the log-book and it represents about three per cent of all ducks taken for the whole period. Neither can it be called common as a wintering duck. In Lynn Bay, Massachusetts, for instance, which is a favorite haunt for Scaup and Golden-eye, the number varied from twenty-five to seventy-two in the winters 1906 to 1918, according to counts made by the late H. W. Wright. It is said on good authority not to be holding its own on the coast of Connecticut and in Long Island Sound.

It passes through the Lake Erie region, that shooters' paradise, in large numbers, but few are killed, and club records give no idea of its relative abundance. The sportsmen are at that time fully occupied with more valuable fowl.

It is not a particularly common duck in the large fresh-water sounds of North Carolina and Virginia but in Pamlico and Core Sounds, North Carolina, it abounds. There must be hundreds of thousands on these great waters, scattered all over the shoaler parts, among Scaup, Golden-eyes, Scoters, Brant and Red-heads. Even farther south than this it is far from rare, not at all uncommon around Charleston (where the Golden-eye is rare) and wintering even to Florida. At Canaveral Club, near Titusville, only five were shot in thirteen years, but this probably does not represent its true status.

On the Pacific coast it is very abundant all the way down to San Diego Bay, where as many as one hundred have been reported at Christmas time (Bird-lore, vol. 25, p. 15, 1923). Its tending to a more southerly dispersal than the two Golden-eyes is well seen on the western coast.

Major Brooks tells me that it is not diminishing as a breeding duck in the interior of British Columbia and it was spoken of as the most abundant breeding duck on the north fork of the Kuskokwim (Dice, 1920). Eastward it is not so common, keeping, of course, to wooded regions, but it is certainly very plentiful on suitable waters all over Alberta, and Harper found it tenth in order of abundance of the breeding ducks at Lake Athabasca, where the number of its nests was apparently limited only by available hollows.

Its winter center of abundance seems to be along the coasts of Washington and Oregon where its numbers have been attested to by very many observers, some even considering it almost the commonest wintering duck. California naturalists have noted some decrease and recorded 328 as sold in San Francisco markets in the winter of 1895–96 (Grinnell, Bryant and Storer, 1918). It must be far from uncommon in autumn in eastern Colorado for as many as 185 have been shot by one club (Kennicott Duck Club) during nineteen years. I do not doubt that it is far more abundant than this score would indicate (Bergtold, 1924).

It is curious that this duck should be so common on the Gulf coast of Texas and Louisiana, but such is the case in many places. Its winter range is indeed a wide one in the West, both on the coasts and in the larger lakes, such as Klamath Lake in Oregon.

In the Mississippi Valley there are indications that it is not as plentiful as it formerly was.

Enemies. In southeastern Alaska A. M. Bailey (MS.) found that mink were catching some of these ducks along the edge of the ice. Allan Brooks found that on the British Columbia coast the Bald Eagle preyed on them, as it did on other ducks. Some are caught in fish-nets in the Great Lakes region and in Pamlico Sound, North Carolina.

Food Value. Before they reach the coast I should rank these among the harmless class of ducks. They are fairly good if one cannot get anything better, and they are often fat. As soon as they strike the coast, especially the old ones, I should place them among the worthless birds for the table. Opinions vary. Some have recorded them as "excellent eating," others as "fishy and unpalatable." Indeed one can experience all degrees of rankness, according to the age and locality of the bird.

Hunt. Buffle-heads are more inquisitive than sociable, but they are willing to try anything once, hence they love to come whizzing over one's wooden decoys even though they have no intention of stopping. They will come, especially the young of the year, close to shore to look over a flock of live decoys. Single birds will, in fact, hardly ever fail to do this in our New England ponds if they are given time enough to explore the pond before they are frightened. As they fly low they have no fear of a battery and they are constantly buzzing over one, but I do not think that I ever saw one alight to a big stool of decoys. They want privacy, but they want to know what is going on, too.

Buffle-heads are distinctly foolish little birds and so a good many are stalked and shot by boy shooters. Then, too, they love to follow close along a lake shore, alternately diving and swimming, giving an easy chance to run down upon them while they are under water. They fetched a very low price in the markets in the old days. Nevertheless a good many were brought in to Boston with Golden-eyes and Scoters.

Behavior in Captivity. Mr. Bendick, of Leduc, Alberta, writes me that he has several times reared them from eggs, but has never kept them over winter. He gets his eggs from wild nests in the vicinity, hatches the young under hens and feeds them boiled eggs, boiled rice, lettuce and boiled potatoes and liver. He lets them swim in a basin eight inches deep with a cement bottom.

Hybrids. None are known.

LONG-TAILED DUCK

CLANGULA HYEMALIS (LINNÉ)

(Plate 67)

SYNONYMY

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Clangula hyemalis Amer. Ornith. Union Check-list, p. 120, 1886.
Fuligula hyemalis Reichenow, Syst. Verzeich. Vög. Deutschl., p. 57, 1889.

VERNACULAR NAMES

English: Long-tailed Duck, Old Squaw, Swallow-tailed Duck, Noisy Duck, Hound, Old Injun, Old Wife, South-southerly, Sou'-southerland, Old Molly, Old

Granny, Mommy, Old Billy, Coween, Cockawee, Scoldenore, Scolder, Quandy, Winter Duck, Sharp-tailed Duck, Caloo, Darcall, Coal and Candle Light, Col-candle-wick, Mealy Bird, Northern Hareld, Curlwee, Ice Duck, Knock Molly, Organ Duck.

German: Eis-Ente, Eistauchente, Eisschellente, Winterente, Isländer Ente, Spiessente, Schwanzente, Langsschwanz, Weissback, Spitzschwanz, Pfeilschwanz, Pihlstaart, Kurzschnabel, Kirre, Gadelbusch, Angeltasche, Hanick, Klashanick, Klashahn.

Italian: Moretta codona, Moretta pezzata, Orchèto marin, Anara da la coa longa, Anarina biancha, Anara forestiera, Magassèto, Magásso foresto, Sarèna, Anedra dalla coa longa.

French: Harelde glaciale, Canard de Miquelon, Fuligule miquelonnaise, Harelde de Miquelon, Miquelon glacial, Canard à longue queue, Petit pilet, Petit dériveux, Morillon glacial, Mielon.

Gaelic: Eun-buchuinn, Lach bhinn, Coul au coule licht.

Icelandic: Hávella, Fóvella, Fóella.

Faroese: Egvedla, Edvedla.

Dutch: Ijseend.

Swedish: Alfogel, Sommaral, Winteral, Galdust, Straare, Alla, Altupp, Algubbe, Alkäring, Brunal, Svartal, Kaulus, Strairat, Haflut, Säflott.

Danish: Havlit, Havlyk, Havlitand, Angeltaske, Agnete, Gadissen, Klaeshahn.

Norwegian: Havelle, Isand, Anke, Floss-aarr, Anglemaka, Ungle, Angeltaske, Troeforer, Havold.

Finnish: Alli, Allitelkkä.

Lapp: Hanna.

Esthonian: Kaupa, Rabais duhkeris.

Helgoland: Grau-linsk.

Czech: Kachna ledni.

Croatian: Norka savka, Patka ledara.

Polish: Kaczka lodówka.

Hungarian: Jeges récza.

Basque: Izotz-ata.

Russian: Vostrovostka, Kaveka, Lüneëk, Savka, Sauka, Morjanka.

Bashkir: Shaitan-cash.

Yakutsk: Biljina.

Ostiak: Aulach.

Samoyede: Angu, A-oo.

Kamchatkan: Aangytsh, Kajur.

Korean: Aalyk.

Kuriles: Aanga.

Japanese: Korigamo, Shima-aji.
Aleutian Eskimos: A-lang-uk.
Alaskan Eskimos: Ahadlin, Ad-le-guk-lu-luk, A-hau-lin, Sou-sou-sally, Adyigia.
Chipewyan Indians: A-ha-lik.
Cree Indians: Ca-ca-wee, Ha-ha-way.
Labrador and Baffin Land Eskimos: Aggek, Aggik, Aggit, Angek.
Greenland Eskimos: Aglek, Agdlek, Agterajik, Ugley.

DESCRIPTION

Adult Male: Forehead and front part of face pale gray; on each side of the neck a large oval patch dark brown in color except at its lower edge, where it is paler; remainder of head and neck pure white to pearly white. Mantle white, continuous with white of neck, but at its posterior border it is black merging with the black of the breast. Inner and upper scapulars white or pearly gray; outer ones, back, central part of rump and upper tail-coverts black. Two central tail-feathers very long and acutely pointed, and the tail dark brown in color, except the outer feathers which are white. Breast uniform rich dark brown, sharply contrasted with the white of the lower abdomen and under tail-coverts. The flanks are light pearly gray. Outer wing-coverts, secondaries and primaries dark brown to nearly black. Under wing-coverts brown; axillars brown.

Iris hazel to reddish hazel, more amber color in winter. Bill, basal half and nail black to blackish lead-color; remainder orange yellow to pale pinkish orange. Legs and feet lead blue to bluish gray, darker about joints and along back of leg; webs black.

Wing 218–240, but few over 230 mm.; bill 26–29; tarsus 33–38.

Weight 1 pound, 8 ounces to 1 pound, 10 ounces (0.68 to 0.73 kilograms).

Adult Female: Forehead, top of the head, and an irregular patch on the side of the neck, black. Remainder of head and neck white. Mantle and scapulars black-brown to rather light brown and somewhat variable in tone. Back, rump, central upper tail-coverts and center of tail dark brown to black. Outer tail-coverts and outer tail white. Upper breast for a narrow band pale brownish shading into the white of the rest of the lower parts. Wing brown as in the male.

Iris dark hazel to yellow. Bill gray-black to greenish slate-color, a little darker toward the tip; sometimes tinged with dull orange. Legs and feet greenish or bluish slate-color, darker on the joints.

Wing 200–215 mm.; bill 25; tarsus 32.

Male and Female in First (Juvenal) Plumage: Distinguished by the uniform dull-gray appearance of mantle and scapulars. The feathers of the upper parts have no light-colored or brownish edges, while the throat and sides of the head are dull gray and not white. There is an irregular whitish area around and behind the eye, but no sharply contrasted face-pattern. The tail-feathers are blunt at the tips.

Immature Male: Although the head and neck regions may develop almost to the adult stage by early winter, the mantle and ornamental white scapulars come in very gradually, and are not usually complete until late winter. The uniform brown breast-shield is never complete the first winter nor are the long central tail-feathers acquired as a rule. These central tail-feathers may be renewed but they do not grow to full length. Most of the under parts, tail and wings remain as in the first plumage until March or April, when a change into the first summer plumage begins. Backward specimens, essentially as in first plumage, are found throughout the winter. Eye brown or hazel.

Immature Female: Gradually changing until distinguished from first plumage by the more mottled appearance of mantle and scapulars due to the more brownish edging of the new feathers. Dark and light areas on head and neck become more sharply contrasted, and by mid-winter the young female may closely resemble the adult female. The moult, however, may be much delayed and in any case the wings, tail, back, rump and much of the lower parts may remain as in the first plumage.

Male, Summer Plumage: This remarkable plumage is acquired between February and June by a moult of the head, neck, mantle, scapulars, upper breast and flanks. The general appearance is entirely changed. Only the sides of the head remain white or grayish white; all the rest of the head and neck and upper breast is black-brown. The whole mantle and scapular region is also dark brown, with light edging to the feathers. The flanks are often browner than in winter. A few birds do not acquire this plumage until July and perhaps some never get it at all.

Male in Eclipse: This is a modification of the spring dress, but the general appearance is the same. The upper mantle is said to be darker than in early summer or spring plumage. Part of this plumage may be carried until late October or early November, but most old males are in complete winter dress by early October, if not before.

Female, Summer: Upper parts darker, duller and more uniform than in winter as far as determined from small amount of material available.

Young in Down: Upper surface black with lighter hair-like feathers. Lower parts pure white to dirty white. There is an irregular white area around eye and sometimes a whitish spot at the base of the culmen. Across the upper breast is a darker band. No white spotting on the upper side.

These young differ from the Golden-eyes and from the Buffle-head by a grayer cheek and throat-patch and by absence of dorsal spotting. They have a superficial resemblance to the young of the Greater and the Lesser Scaups, but the under side is grayer, with no tinge of buff or yellow, while the bill is very much shorter.

DISTRIBUTION

The Long-tailed Duck is the most arctic of the whole family; essentially a breeding bird of the tundra areas, it is seldom seen even in winter anywhere south of the north-temperate regions.

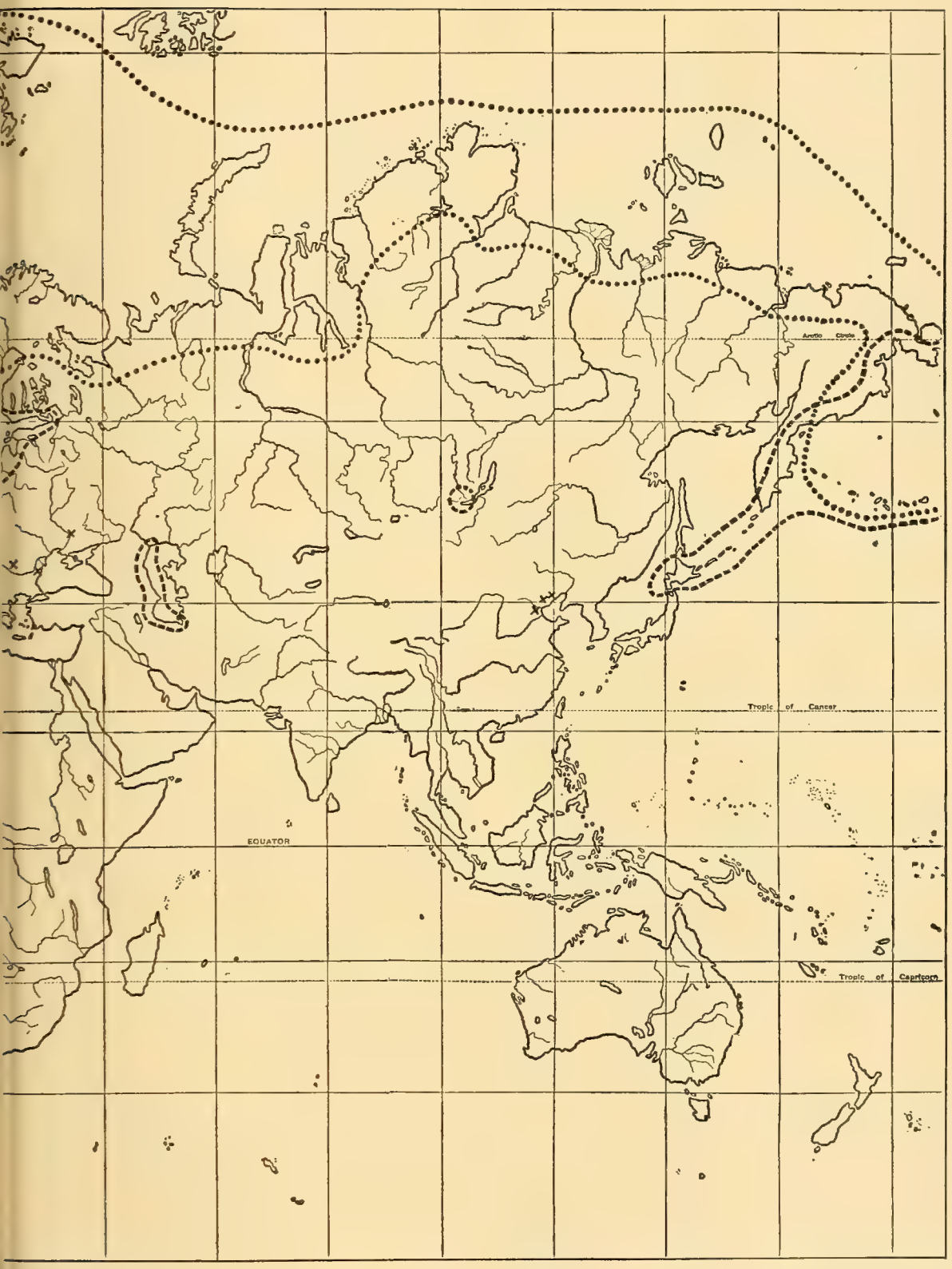
Breeding Range

Alaska

In the New World this species nests in small numbers on the Aleutian Islands (L. M. Turner, 1886; Nelson, 1887) and more commonly on other islands of the Bering Sea, as on the Pribilovs (Coues, 1875; Elliott, 1882; Palmer, 1899), St. Matthew (G. D. Hanna, 1917) and St. Lawrence (W. S. Brooks, 1915). It is not an uncommon bird in summer at some points in southern Alaska (J. Grinnell, 1910; Bailey, MS.) but these are probably mostly young non-breeding birds. Still, a pair is said to have nested on Forrester Island, southeastern Alaska (Heath, 1915) and Bretherton (1896) thinks the species probably nests on Kadiak Island. Einarsen (Murrelet, September, 1922) has reported the species nesting at Ugashik on the west coast of the Alaskan peninsula. According to Nelson (1887) it is a fairly common breeder on the Yukon and other rivers of the interior, but the chief breeding areas are along the western and northern coasts. Nests have been taken as far south as Lake Aleknagik, north of Bristol Bay (U.S. Biological Survey). E. Adams (1878) and L. M. Turner (1886) considered it a not very common nester about St. Michael's, but a more recent observer, F. S. Hersey (1917), says it is an abundant nesting bird there. Farther north along the coasts of Kotzebue Sound, Point Barrow, and eastward to the Canadian border enormous numbers nest regularly (Dall and Bannister, 1869; Nelson, 1887; Seale, 1898; R. M. Anderson, 1915; W. S. Brooks, 1915; etc.).

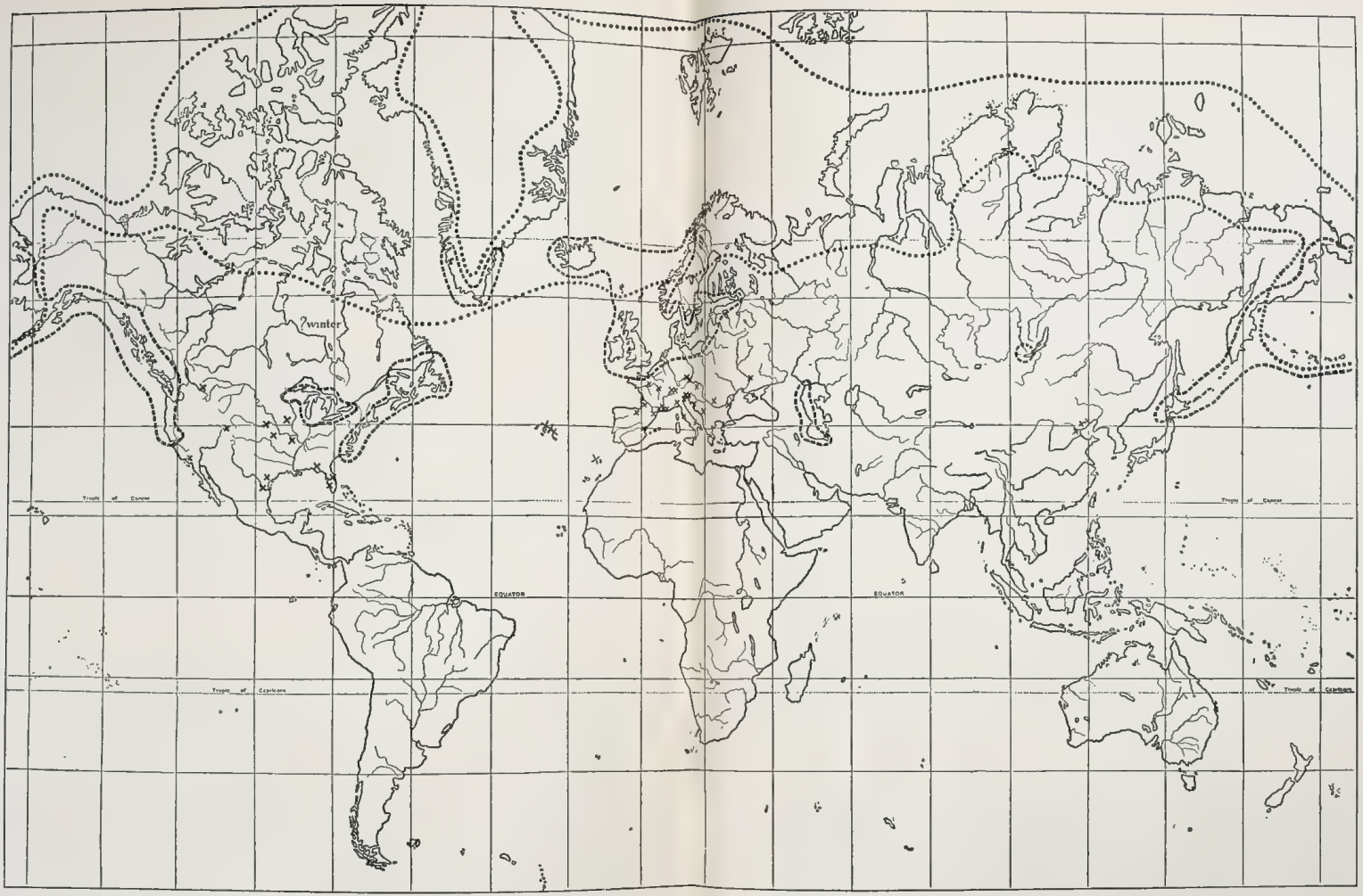
MAP 94. Distribution of Lon

Breeding range, dotted l
Sporadic records i



d Duck (*Clangula hyemalis*)

ter range, broken line
by crosses (×)



MAP 94. Distribution of Long-tailed Duck (*Clangula hyemalis*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

In northwestern Canada the Long-tail nests only north of the forested areas, and generally near the Arctic coast. During May and June large numbers have been seen in the MacKenzie valley (Preble, 1908), but these are birds migrating northward. The species does breed on Herschel Island (Raine, 1892) and evidently on the MacKenzie delta (Frank Russell, 1898). Eastward, great numbers nest on the Arctic coast about Franklin Bay and Coronation Gulf (R. MacFarlane, 1908; R. M. Anderson, 1917), and in the interior about Fort Anderson (R. MacFarlane, 1908) and farther south on Artillery Lake, Casba Lake, Clinton-Colden Lake and the head of Back River (Seton, 1911). According to C. W. G. Eifrig (1905) great numbers were found nesting about Cape Fullerton on the northwest coast of Hudson Bay.

Northern Canada

The Long-tail has been met with by explorers on almost all the Arctic islands of Canada. Armstrong (1857) found it common near Prince Alfred Cape, Banks Land, in August, and R. M. Anderson (1917) has recorded it from Cape Kellett on the same island. Both Franklin (1823) and T. Simpson (1843) saw numbers in August on Melville Sound. Mr. Stefánsson writes me that he saw the species everywhere in the Parry Islands and found it breeding as far north as Hassell Sound. Bay (1904) reports it common and breeding in King Oscar Land, and Greely (1886) found it not uncommon about Discovery Harbor and the interior of Grinnell Land. Bessels (*fide* Schalow, 1905) found nests at Thank God Harbor, south end of Robeson Channel. The northernmost record of its occurrence anywhere is that given by Feilden (1877, 1908) who found the species common and breeding at Floeberg Beach and on the north coast of Grant Land, 82° to 83° north latitude. MacMillan (1918) also took a nest and eggs on the north shore of Grant Land, at Mushroom Point. Farther south it has been met with on the south side of Lancaster Sound and on North Somerset Island (*fide* Cooke, 1906). Kumlien (1879) states that it nests on Cumberland Sound and Hantzsch (1914; see also Hesse, 1915b) found it a common breeding bird on the great lakes of the interior of Baffin Land. C. W. G. Eifrig (1905) reports it breeding commonly on the Southampton and other islands in the north part of Hudson Bay. Parry (Richardson, 1825) saw some at Winter Island, Melville Peninsula, and Rae collected one at Repulse Bay that is now in the British Museum.

Arctic North America

Payne (1887) found the Long-tail common about Wales Sound, northwest Labrador, and L. M. Turner (1885) states that it nests in the Ungava region. Hantzsch (1908) found it breeding, but not in great numbers, about Port Burwell and on the east coast of Ungava Bay. On the east coast of Labrador nests have been taken at Okak and Nain (*fide* C. W. Townsend and Allen, 1907). Audubon found many broods on the south coast of Labrador near Bradore, and Comeau (1909) says some still nest on that coast. A. E. Verrill (1862) spoke of it as an abundant breeder on Anticosti Island and Brewster (1884) was told by local fishermen that the species nested in that vicinity. Cory (1878) has recorded a specimen taken as early as August 14 on the Magdalens but it is doubtful whether the species now nests anywhere in the Gulf of St. Lawrence.

Labrador

Summer Stragglers

Non-breeding birds occasionally stay rather far south. Indeed, Sanford (Sanford, Bishop and Van Dyke, 1903) states that he saw a pair, one of which was doubtless a cripple, with young, off Little Gull Island, Long Island Sound, in the summer of 1886, and A. A. Saunders (1913) has reported three birds seen on August 2, 1906, at West Haven and fifteen to twenty seen on July 14, 1913, near Westport, Connecticut. Crippled or non-breeding birds have also been seen in summer at other localities all along the New England coast.

In Greenland the Long-tail nests on both coasts. Just what the limits of its range in this region are we do not yet know, but it certainly nests in all the northern parts. MacMillan (1918) found it breeding about Etah, and Peary met with it in late June at Tuctoo and Glacier Valleys (W. Stone, 1895). F. M. Chapman (1899) has recorded it from Holsteinborg and Olrik Bay in June and July, and Vanhöffen (1897) found it nesting at Karajak, Nunatak, and commonly as

Greenland

far south as Upernavik. I doubt whether many nest in southwestern Greenland. On the east coast it has been found at Angmagsalik, where it breeds (Helms, 1904) and at Scoresby Sound, Clavering Island and Cape Borlase Warren (Winge, *fide* Schalow, 1905). Kolthoff (1903) has recorded specimens from Aulaitsivik Fjord, MacKenzie Bay, and Myskox Fjord, and Manniche (1910) speaks of it as very abundant in northeastern Greenland as far north as 80° 23′.

Iceland

Next to the Scaup, the Long-tailed Duck is perhaps the commonest nesting duck in Iceland, where it is widely distributed and a well-known resident (Faber, 1822; Krüper, 1857; H. J. and C. E. Pearson, 1895; Riemschneider, 1896; Slater, 1901; Hantzsch, 1905; Millais, 1913; etc.).

Faroes
Shetlands
Orkneys

Some of these ducks are repeatedly seen in summer on the Faroes, Shetlands, and Orkneys, and the species is said to have nested on the Faroes (H. C. Müller, 1869). Of course, most of these individuals are non-breeding birds, and the difficulty of identifying the eggs makes the question as to whether it has actually nested, a complicated one. Eggs supposedly of this species have at least three times been taken on the Shetlands, but the most critical writers (A. H. Evans and Buckley, 1899; Millais, 1913) are not satisfied with the evidence. In 1911, Aplin (1911, 1912) reported the species as breeding on Pomona, in the Orkneys. After a long discussion (see British Birds, vol. 5, p. 203, 1911; vol. 6, pp. 128, 199, 263, 1912–13) the eggs and down were examined by one of the editors of British Birds, who was satisfied as to the correctness of the identification (British Birds, vol. 7, p. 205, 1913).

Norway
Sweden
Finland

On the Continent the Long-tail nests in Norway as far south as Dovre-Fjeld, Valders and Trondhjem (Collett, 1873; Schaanning, 1913; Millais, 1913), but it is a common breeder only in the regions north of Tromsö (*ibid.*; also Hartwig, 1889; H. J. Pearson and Bidwell, 1894). In Sweden it nests only north of about 64° or 65° (Wallengren, 1854; Nilsson, 1858). The same is true of Finland, where it nests chiefly on the Arctic coast and in Lapland about Enontekis, Enare, Utsjoki and Muonio (Palmén, 1876; S. A. Davies, 1905; Montell, 1917). About Sodankyla (68° north) it was rare (Finnilä, 1913). A few are not uncommonly seen on the coasts of the Finnish Gulf (Palmgren, 1913; etc.) but there is only one record of its nest having been found there (Nordling, 1904).

Russia

In Russia this species nests only in the northernmost parts, in Russian Lapland and on the Murman coast (Witherby, 1900; H. J. and C. E. Pearson, 1904; Bianchi, 1902b) and especially on the tundra from Archangel to the Petchora region (Goebel, 1873; Seebohm, 1882a, 1885). Von Brandt (1880) is undoubtedly wrong in saying that it breeds commonly on the Gulf of Finland and on the Neva, and I am inclined to pass over the statements of Menzbier (1883) that it breeds rarely in the Moscow Government, and of Sabanäeff (*fide* Dresser, 1871–81) that it nests in Jaroslav.

Arctic Europe

In the Arctic Ocean these ducks have been seen in small numbers on Jan Mayen, where presumably they nest (F. Fischer and von Pelzeln, 1886). Swenander (1900) took a mature egg from a female shot on Bear Island, but the species is not common, although well distributed, in the Spitzbergen group especially on the western and northern coasts (Malmgren, 1863; von Nordenskiöld, 1882; Bianchi, 1902b; Schalow, 1905; Koenig, 1908; Zedlitz, 1911) and has, so far as I know, been found nesting only at Whale Point Harbor in East Spitzbergen (A. Walter, 1890; W. E. Clarke, 1899) and about Ice Fjord on the west side and Liefde Bay on the north (Jourdain, 1922). It has not yet been reported from Franz Joseph Land, but it is exceedingly abundant on Nova Zembla and Waigats, especially in the southern parts (Spörer, 1867; von Heuglin, 1872; von Nordenskiöld, 1882; Molčanov, 1908; H. J. Pearson, 1896), and breeds in great numbers on Kolguev, too (Trevor-Battye, 1895; *et al.*).

Western Asia

Sabanäeff (Harvie-Brown, 1878) thinks the Long-tail probably nests on the east side of the Urals, about Shadrinsk and Suschkin (1914) states that it is a very rare summer resident in the Ilezk district of the Kirgis. But even if it nests in these places, it must be regarded as sporadic or "extra-limital." In Asia, as in Europe and America, the nesting areas are confined to

the open arctic tundra, where these ducks are very abundant. On the coasts of the Samoyed (Yalmal) peninsula it seems to be particularly numerous (von Nordenskiöld, 1882; Collett and Nansen, 1899; Birulia, 1907; Zitkov, 1912) as also about the mouth of the Ob (Finsch, 1877), on the lower Jenesei (M. F. Schmidt, 1872; Popham, 1898; Haviland, 1915) and about the Taimyr peninsula (A. T. von Middendorff, 1853; von Nordenskiöld, 1882; Walter, 1902; Birulia, 1907). Von Bunge and von Toll (1887) found it common about the mouths of the Lena and the Jana as well as on the New Siberian Islands (see also Birulia, 1907), and both Buturlin (1906) and Riley (1918) note many about the mouth of the Kolyma. Thence eastward along the Arctic coast to Bering Straits it is everywhere abundant (von Nordenskiöld, 1882; Thayer and Bangs, 1914). We do not know whether this duck nests on the Kamchatkan coasts, but it does so on the Commander Islands (Stejneger, 1885; Bianchi, 1909) and a few are said to nest on the mainland about Marcova (J. A. Allen, 1905). Specimens have been taken in June and August on Saghalin Island (Lönnberg, 1908; Hesse, 1915) but there is no evidence that the species nests there.

Eastern Asia

Winter Range

In the New World the Long-tailed Duck winters in great numbers on the Aleutian Islands, and on the Alaskan coasts south of Bering Strait (Dall, 1874; L. M. Turner, 1886; Nelson, 1887; Bretherton, 1896; Willett, 1914; Bailey, MS.; *et al.*). It is abundant on the coasts of Vancouver and British Columbia (Fannin, 1891; Kermode, 1904). According to A. Brooks (1903) it is common even in the interior, in the Cariboo district.

Alaska

British Columbia

Many also winter on the coasts of Washington (W. L. Dawson and Bowles, 1909; Rathbun, 1915) and in lesser numbers on the coast of Oregon (Pope, 1895–96; Woodcock, 1902) and northern California (J. Grinnell, Bryant and Storer, 1918) though specimens have been taken as far south as San Diego (*ibid.*; also Anthony, 1922). In the interior it is very rare, though it has been taken in the cold months in Montana (A. A. Saunders, 1921), Colorado (W. L. Sclater, 1912; Bergtold, 1924), Nebraska (Bruner, Wolcott and Swenk, 1905), Kansas (H. Harris, 1919), Missouri (Widmann, 1907) and Iowa (R. M. Anderson, 1907). Stragglers have been shot in Texas near the mouth of the Rio Grande (Strecker, 1912), at Fort Clark (U.S. National Museum), one at Lake Surprise (U.S. Biological Survey) and two at Cove (R. B. Lawrence, 1922), and in Louisiana on Lake Catherine (Kohn, 1885) and at Bayou Barataria (Beyer, Allison and Kopman, 1907).

Pacific Coast

Interior

Texas

Louisiana

Some Long-tails winter as far north as Hudson Bay and many were taken at Cape Fullerton (Low, 1906). On the Great Lakes, too, it is an abundant wintering species; in Minnesota (Roberts, 1916), Wisconsin (Kumlien and Hollister, 1903), Illinois (Ridgway, 1895; Woodruff, 1907), Indiana (A. W. Butler, 1898; C. W. G. Eifrig, 1919), Michigan (Barrows, 1912), Ohio (L. Jones, 1903), western New York (Eaton, 1901) and Ontario (Raine, 1892; McIlwraith, 1894).

Hudson Bay

Great Lakes

On the Atlantic coast this bird is found in winter as far north as the Gulf of St. Lawrence, on the north shore (Comeau, 1909), on Anticosti (Schmitt, 1904) and in western and southern Newfoundland (Millais, 1913) as well as in New Brunswick (Chamberlain, 1882; Bain, 1885; Dresser, 1871–81) and Nova Scotia (Downs, 1888). It is abundant all along the New England coast (G. M. Allen, 1909; *et al.*), in southern New York (Eaton, 1910), New Jersey (W. Stone, 1909), Delaware (Rhoads and Pennock, 1905) and southeastern Pennsylvania (B. H. Warren, 1890), as well as in Maryland (Kirkwood, 1895) and Virginia (Rives, 1890). In North Carolina it is said to be uncommon (T. G. Pearson, C. S. and H. H. Brimley, 1919) though on Pamlico Sound I have seen a great many in December and January. In South Carolina it is of unusual occurrence, appearing only in severe winters (Wayne, 1910). In Florida it is only a straggler; specimens have been recorded from Titusville (Cory, 1895; W. Y. Peters, *in litt.*), Leon County (R. W. Williams, 1904), Lake Jackson (U.S. Biological Survey) and Tampa (U.S. National Museum).

Atlantic Coast

Greenland
Iceland

In Greenland the Long-tail winters all along the southern coasts, wherever the sea is open (Holböll, 1846; Chamberlain, 1889; Vanhöffen, 1897; Helms, 1902), and in Iceland it spends the cold season on the coasts (Hantzsch, 1905; *et al.*).

Faroes
British Isles
Norway
Sweden
Finland

On the Faroes (H. C. Müller, 1869) and on the Shetlands (A. H. Evans and Buckley, 1899) it is abundant, and the same is true of all the coasts of the British Isles and neighboring islands, though the species is not very common in the southern parts (Dresser, 1871–81; H. Saunders, 1899; Ussher and Warren, 1900; Millais, 1913; Witherby *et al.*, 1919–22; *et mult. al.*). On the Continent many winter on the southern coasts of Norway (Collett, *fide* Dresser, 1871–81; Schaanning, 1913), rarely north as far as the Lofotens (Boie, 1869), and in great abundance on the southern coasts of Sweden and Gothland (Wallengren, 1854; Nilsson, 1858). It is common also on the southern coasts of Finland (Palmén, 1876), and on the littoral of the Baltic States (Goebel, 1873; Dresser, 1871–81; Sawitzky, 1899; Loudon, 1909). It is rarely seen in winter in Poland (Taczanowski, 1888), but is extremely abundant on the Baltic coasts of Germany (Naumann, 1896–1905; von Droste-Hülshoff, 1874; Dresser, 1871–81) and Denmark (Kjärbölling, 1850). In the interior of Germany it is, of course, rare, though specimens have been taken on the Rhine (Le Roi, 1906–07, 1910), in the Palatinate (W. and T. Heussler, 1896), in Saxony (Naumann, 1896–1905), Brandenburg (Schalow, 1915) and in Posen (Hammling, 1917). On the North Sea coasts of Denmark and Germany it is less common than on the Baltic, but great numbers are found there in severe winters (Naumann, 1896–1905; Löns, 1906; etc.). On the Dutch coasts it is usually rare (van Oort, 1908) and on the Belgian seaboard occurs only in severe winters (Dubois, 1886). Only very few occur on the Normandy coasts (Ternier and Masse, 1907), but stragglers have been taken in the interior in Picardy (d'Aubusson, 1911), Alsace (G. Schneider, 1887), Anjou (Rogeron, 1903) and in the departments of Seine-Inférieure, Doubs, Hérault, Nord, Manche, Calvados, Indre and Saône-et-Loire (Paris, 1907, 1911). In southern France it is an extremely rare straggler, specimens having on occasion been taken in the southwest and in Provence (J. H. Gurney, 1901; l'Hermitte, 1916).

Holland
Belgium
France

Portugal
Spain
Italy

So far as I know this duck has never been taken in Portugal (although Koenig, 1890, says he saw one off the coast) and very rarely in Spain: once at Zarauz, near San Sebastian (Aldaz y Amazabel, 1918), in Gerona (Vayreda y Vila, 1883) and once on the Albufera of Valencia, December, 1921 (Pardo, 1922). Occasionally it strays to the Azores (Hartert and Ogilvie-Grant, 1905) and Madeira (Schmitz, 1909). It has, I believe, never been taken in Africa, in Corsica, Sardinia, Malta or Sicily. In Italy a few have been taken as far south as Bari, and others in Tuscany, Liguria, Lombardy and Emilia. In Venice immature birds are not rare, as many as one hundred having been taken in 1887, while Count Ninni is said to have shot thirteen in one day in 1896 (Giglioli, 1886; Arrigoni degli Oddi, 1904)! It is a rare bird on the eastern coast of the Adriatic (Kolombatovič, 1903), but is not exceptional on the lakes of Switzerland (Fatio, 1904). Some are occasionally seen in Bohemia in severe winters (Fritsch, 1872) and on the larger rivers of Austria (Althammer, 1857; Crown-prince Rudolph, 1879; von Mojsisovics, 1886; Mojsisovics von Mojsvár, 1897) and the rivers and lakes of Hungary (Aquila, vol. 2, p. 48, 1895; von Chermelháza, 1907). I have been unable to find any records of its occurrence in the Balkans (except in the Dobrudja, according to Dombrowski) or on the Black Sea, though Valkh (1911) states that a few occasionally winter in west Ekaterinoslav.

Dalmatia
Switzerland
Czecho-Slovakia
Austria
Hungary
Balkans
Russia

On the Caspian, however, the Long-tail winters in some numbers, rarely in the north about Astrakhan (Seebohm, 1882), but quite commonly on the south Caspian (Seebohm, 1883; Radde, 1886; Zarundy, 1911). In regard to its other wintering grounds in Asia we know practically nothing. Presumably it is found on all the large lakes of central Asia and western Siberia, as it is abundant on Lake Baikal (Radde, 1863). In China it has been seldom recorded: once at Taku (von Heuglin, 1874a) and twice at Chinwangtao, northeastern Chili, in early April (La Touche, 1921). Mr. Kuroda writes me that it is abundant in

Caspian
Siberia
China
Japan

winter at Gensan, Korea, and in Awomori Bay in northern Japan. It has frequently been obtained in Shimosa Province near Tokyo, this being the southernmost limit in Japan. It is said to be common on Yezo and the Kuriles (Whitely, 1867; Seebohm, 1890; Hatta and Murata, 1905–06), as well as on the Commander Islands (Stejneger, 1885; Bianchi, 1909; Hartert, 1920) and presumably on the Kamchatkan coasts. Thayer and Bangs (1914) have recorded a few found wintering on the Arctic coast on Diomede Island.

Arctic Siberia

Migration

As might be expected of so hardy a bird, it is a very early migrant in spring, passing north with the opening of the ice. Most have left the winter quarters by the end of April and arrive on the breeding grounds in May and June. Still, a good many stay late, even well into May along the North Atlantic coast and late May along the Athabasca River. Possibly these are destined for far-northern lands. In the autumn they disappear from the nesting areas in September and put in a first appearance on the wintering grounds by mid-October increasing until the end of November. It is astonishing how long they will stay north on occasion. Specimens have been taken as late as December 9 at Point Barrow (Murdoch, 1885), as late as December 7 on Jan Mayen (F. Fischer and von Pelzeln, 1886) and during the whole winter on Diomede Island (Thayer and Bangs, 1914).

The migration is very commonly overland both in spring and in autumn mostly by way of great lake systems. Thus the Long-tails that breed on the Arctic coasts of North America come down the MacKenzie basin and along the great Canadian lakes to our own Great Lakes. They are common migrants there in the spring. Others pass over Keewatin. There is some evidence that they may cut overland as Brant do, across the isthmus of the Labrador peninsula for the great bodies are not seen beyond a certain point (Moisie) on the north shore of the Gulf of St. Lawrence (C. W. Townsend, 1910a, p. 52). In Europe there is quite a distinct movement down the Rhine to the lakes of Switzerland, and stragglers in the interior are usually found on the large rivers. In Finland, too, the species seems to come south through the interior, and in Russia the migration from the Arctic coasts to the Caspian is along the great rivers.

As with many of the northern diving ducks, the females, and especially the young, migrate earlier than the adult males. In southern Europe at least, adult males are almost never taken, and in British waters old males are found apart from females and young. We can say with certainty that the autumn and winter distribution of the sexes is very different, although it is not certain that males always remain farther north during the winter.

In thirty-five years of shooting records at Cohasset, Massachusetts (B. P. Clark, MS.), the average time of first appearance is October 8 to 9 and this arrival is rather regular. October 4, 5 and 6 are the first dates that occur many times. There are four September records and one in August (perhaps merely a local summering bird). The latest first appearance was in 1887 when the species was not seen until October 22.

The first autumn records at Holkham Bay, southeastern Alaska, were September 25 and 26 (A. M. Bailey, MS.) and they remained abundant in that region until April 1.

GENERAL HABITS

So familiar is this handsome duck to the winter shore-shooters and naturalists who frequent the waters of any northern coasts, that it is scarcely necessary to deal with its habits at great length. So lively, clamorous and showy a bird is sure to draw attention to itself, hence it has been much written about. All winter long it enlivens our dreary coast, bravely riding out the stoutest gales, often preferring the open sea when sheltered bays are near at hand. Then in the spring it rushes up to the Arctic

regions betaking itself to the melting tundra pools long before the sea ice has broken up, almost the first to bring the glad news of the warmer season. With the King Eider it shares the distinction of being the most northerly breeding of the whole duck tribe. Many an anxious explorer has blessed this brave little wanderer, even praised its strong and fishy meat; and if we but knew it, how many folk-lore tales of the Eskimo must have been framed around it!

Very distinct from all other ducks in appearance, structure, the sequence of its moults, its habits and its curious voice, it is rightly placed in a genus by itself. It is difficult to say what its nearest relatives may be. It has little in common with the Eiders except in habits fostered by a common environment, but something perhaps with the Harlequin.

Wariness. Although a few writers have described this duck as wary or wild, most of them have placed it where it belongs, among the least susceptible of education. Its restless behavior may give the impression of wildness, but it seems to have no eye for danger points. It will decoy readily to a flock of Scoter decoys close to a boat and it has no fear of points or sand-spits during its daily wanderings. Most marked of all is its absolute contempt for the roar of a shotgun. It has a good deal in common with the Scoters in this respect. Continual disturbance does not appear to bother them at all. A shotgun they scorn, sometimes decoying, as L. Lloyd (1867) remarked, right in the smoke of a previous discharge, while I have often seen them feeding happily up among wharves at the head of a busy harbor, where they were disturbed every few moments.

Millais (1913) and others have noticed that they grow wilder just before the time of leaving in the spring but this has perhaps some connection with the onset of the migration urge. They are not wild on their breeding grounds.

Old-squaws are extremely reluctant to fly directly over a head-land, or even a sand-bar; even in the heaviest gales they only rarely come in to sheltered fresh-water ponds near the coast and if they do so they appear uncomfortable and restless and soon depart, sometimes without even alighting. Shooters know how difficult it is for them to change their course, once they have made up their minds. They seem quite oblivious to what is going on around them and are not easily scared away by movements on shore.

They are not much afraid of a sail-boat either, and as they jump up-wind when flushed, often coming up toward the advancing craft for a good distance before sheering off, it is easy to get near them in this way. They pay little attention to advancing steamers and often cut across within half a gun-shot of their bows.

Naturally it is easier to get among them in autumn and early winter when there are many young birds, than it is later on. Some observers have found the females shy on the nest and were never able to catch them sitting (Hesse, 1915).

Daily Movements. This duck, like the Golden-eyes and the Eiders, is almost entirely a day-feeder. I do not know whether they have ever been actually seen feeding at night. For the most part their flights in the evening are away from bays, harbors or shallow feeding places off-shore, returning like the Eiders in the morning. One can see this all winter along our coast. Some birds seem never to leave the open waters, even in the most severe northeast gales, riding out the sea all day and night and feeding just outside the huge breakers. Their winter flights are wholly over the water, no matter how far they have to go around to get to the open sea.

As a general rule they never resort to fresh-water ponds for shelter during autumn or winter, but such habits have been noticed in the spring in East Prussia, where with the Scaup they came in to fresh water for the day, returning in the evening (von Droste-Hülshoff, 1874). Also on Nantucket Island off Massachusetts they have sometimes taken to similar habits in March and April (Mackay, 1892).

Movement is controlled a good deal by the tides and winds but they can feed in really deep water if they have to. During the night they drift about, returning to their day grounds in early morning. While feeding in a seaway they drift downwind and recover their ground by frequent short flights.

Gait, Swimming and Perching. The posture and gait on land, where they are very seldom seen except in the breeding season, are upright, yet Mackay (1892), who saw starving flocks feeding on the upland in Massachusetts, said they were nimble, even rather graceful.

In the water the striking color-pattern, nearly white head and dark wing, identify both sexes in the mature plumage. The immatures may be easily confused with the female or young of the Harlequin (*q. v.*). In the ordinary swimming posture the tail is not carried at the elevation so often pictured. Often it drags upon the water and at times it is even submerged. It is raised well above the water only during courtship play.

Very rarely during the winter single birds will "haul out" on some rock or sandbar, but they do this less frequently than almost any other species.

Old-squaws, together with Eiders, are able to reach greater depths than any of the other diving ducks. Although their favorite feeding grounds are shoals and rocks in twelve to twenty-five feet of water, they must go to much greater depths at times, for we have such testimony from many fishermen in various parts of the world. Some of these reports are so extravagant that they can be dismissed without further consideration. Such, for instance, as the statement of a captain on Lake Erie who claimed to have caught three in a gill-net at 162 feet (Bacon, 1892). Nevertheless it is certain that many are taken at fifty feet and even at ninety feet, which seems to be about the maximum depth on Lake Erie (Bacon, 1892; W. E. Saunders, *in litt.*; Sterling, 1890). Naumann did not believe they could reach bottom in depths

of over forty-five feet, and it is very likely that at extreme depths they are not feeding on bottom but are pursuing fish or other swimming creatures.

The ordinary dive is apt to be somewhat longer than the Scaup's or the Golden-eye's, varying from thirty or forty to fifty or sixty seconds. Much shorter dives in shallow water are by no means unusual. The longest period I have seen mentioned is one of ninety seconds, timed by L. M. Turner (MS.), and it is noticed that after these very long dives there is a longer period above water, perhaps one or two minutes. At a depth of thirty-five feet one stayed under for sixty-five to seventy seconds (J. A. Anderson, 1920a). Usually when bottom-feeding at ordinary depths the rest period is short, say from six to twelve seconds. When coming up from a dive a soft bubbling sound can be heard, as in other diving ducks, caused by the sudden intake of air through the wet nostrils. Most of the food is swallowed under water. Both this duck and the Harlequin, as well as the Scoters, often use their wings under water. This has been noted by many good observers. Even before the dive, or rather just as the bird disappears, the wings can be seen half open (Saxby, 1874; C. W. Townsend, 1909; Burtch, 1923).

It seems that when shooting up to the surface and prepared for an instant flight they also may hold the wings open (H. W. Robinson, 1913).

If shot at when flying the Long-tail will sometimes dive from the wing, even though unhurt, as I have seen often enough, and if wing-broken they waste no time on the surface.

Flight. Their appearance in the air is most characteristic. They fly low, and with a swinging undulatory flight, dodging through the hollows of the waves and flashing their white breasts, first to one side and then to the other, unlike the more steady and bullet-like progress of Golden-eyes, Scoters or Eiders. But perhaps the most characteristic feature, and one that identifies them at almost any range, broadside-on, is the peculiar direction or curve of the wing stroke. Just how this actually differs from that of other ducks it would be hard to say without a series of comparative photographs, but the impression on the eye was well brought out by Griscom (1922–23). He explains that the wings are held more curved, which produces the following effect. The wing-tips, instead of moving up and down at right angles to the body, seem to be directed backward toward the tail during the downstroke. Also the wing is brought less above the body during the upstroke, and much lower during the downstroke than in any other duck. He also called attention to the trick of "keeling over" a little to one side in flight.

Another marked characteristic of the Long-tail is the way in which it suddenly plumps down from the wing, striking the water with its breast and making a splash, not gliding on down as other ducks do.

The silhouette of the Old-squaw in flight is also far different from that of the

"Garrots," the Scoters or the Eiders. The body is round, but there is the slim neck and small aristocratic-looking head which differ decidedly from those of all the other sea ducks.

These ducks migrate in large flocks and their journeys overland must be performed entirely at night. Flocks of a hundred or more are common, but when settled on their feeding grounds they usually break up into groups of a dozen or fifteen.

I have never seen flocks "tower" high in the air in the manner described by Mackay. He noticed this habit both in the spring and in the autumn, when the birds would collect in large flocks in calm, mild weather, going up in circles so high as to be hardly visible, often coming down with tremendous velocity and a noise of wings audible at a great distance. Mackay once saw the arrival of a large migrating flock, flying very high, which on reaching its chosen destination circled around three or four times before alighting; the birds then, after remaining together for about an hour or so, broke up into groups of a dozen or more.

Association with other Species. Although gregarious these ducks are very independent of other water-fowl and even when their feeding grounds are occupied by Scaups, Eiders and Scoters they keep aloof and by themselves. Even single migrants are apt to journey by themselves. Saxby (1874) remarked on their dislike for the company of Cormorants, and says they desert their usual haunts when Cormorants come in to feed on the young of the coal-fish in the Shetlands.

Faber (1822), the earliest writer on the bird fauna of Iceland, says the Long-tails will often drive Scaups off their nests and lay their own eggs in them, after which they incubate the joint clutch. Other observers have noted that in Iceland they nest side by side with the Scaup, and Shepard (in Baird, Brewer and Ridgway, 1884) found one joint nest on which a Long-tail and a Scaup were both incubating. H. J. and C. E. Pearson (1895) found Goosander's eggs in the nest of a Long-tail.

Voice. Probably more ink has been devoted to attempts at describing the voice of the male, than is the case with any other duck. Were I to invent a new series of sounds I should not come any closer than the rest, for one must go to the coast one's self on some calm morning in March to get any real idea of it, and the journey will not be in vain if there are any birds within a mile or so.

I do not know whether this bird's courtship song, for such it really is, has musical merit or not. To a lover of Nature most natural sounds are musical, or at any rate pleasing to the ear, and this one is no exception. It ranks, perhaps, with the spring song of the Ring-necked Teal as about the best performance among the ducks. Some of the Long-tail's many names, like South-south-southerly, Coc-caw-wee, Coul-au-coule-licht, suggest the several syllables of the call. The Alaskan Eskimo name, Ad-le-guk-lu-luk is rather suggestive. The noise from a group of males has

been likened to distant bagpipes or even to a pack of hounds, while the constant repetition has given it names like "Old-wife," "Old Granny" or "Scolder." This call is used at all times of the day or night either on the water or in the air. It is heard all winter, but more violently toward spring and it ceases only after the breeding season is over.

Few naturalists seem to have heard the female's voice. In contrast to her mate she is indeed one of the most silent of wild-fowl. Hantzsch (1905) described the sound as a soft *wed*, *wad*, or *wud*. I do not recall ever having heard the note myself, for it is most difficult to pick it out from the chorus of a mixed flock.

The trachea of the male is unique. It has been well figured by Eyton (1838) and later writers. At its lower end the wind-pipe is somewhat enlarged and flattened, with five small window-like areas facing forward and to the right. The bony box is large and roughly kidney-shaped, facing mostly to the left and furnished with a single large membrane on the outer side.

Food. The winter food of the Long-tail consists chiefly of small univalve and bivalve mollusks with crustaceans and occasionally small fish. The stomachs of this species examined by the U.S. Biological Survey were collected in the northern States, Canada, and Alaska mostly during the months from October to April. Well-filled stomachs upon which percentages of food items can properly be based number 53, and they indicate that less than a tenth of the subsistence of the Old-squaw is derived from the plant kingdom. The vegetable food consists mostly of seeds of pond-weeds (*Potamogeton*, *Zannichellia*, *Hippuris*) with some foliage of these and similar plants, and of algæ.

The most important elements of the animal food are mollusks and crustaceans. Univalves and bivalves are taken to about an equal extent, and among the latter are some commercial varieties, as the common mussel and the scallop. The crustaceans include diverse groups; the amphipods or water-fleas are much favored, and various small crabs, including hermits, are freely eaten; one stomach contained remains of 37 mud crabs. Several other groups of marine organisms taken with nearly equal frequency compose only a minor part of the subsistence; these include foraminifera, bryozoans, barnacles, hydrozoans, sea urchins and marine worms. In fresh water, larvæ of caddis-flies and midges are most often taken; between four and five hundred of the latter were present in a single stomach. Small fishes are occasionally eaten by the Old-squaw.

Three stomachs from St. Michael's, Alaska, in June give some idea of the summer food. They contain on the average 20 per cent of vegetable matter, including the seeds and foliage of pond-weeds, and the seeds of sedges. The animal food was midge and caddis larvæ; 250 of the former made up 97 per cent of the food of one of these birds (W. L. McAtee, MS. notes).

In Europe the mollusks ordinarily taken in winter include *Mytilus edulis*, *Cardium edule* and *Tellina cornea* (Naumann, 1896–1905). W. Thompson (1851) found different species of *Rissoa*, small specimens of *Cerithium reticulatum*, and *Nucula margaritacea*. Small crustaceans (*Gammaridæ*) and shrimps (*Crangon vulgaris*) are also taken. Mackay (1892) reports finding a little shell-fish (*Venus mercenaria*), short razor-shells, fresh-water clams, small white perch, small cat-fish, penny shells (*Astarte castanea*), red whale-bait (brit), shrimps, mussels, small blue-claw crabs and pond-grass in Massachusetts. The summer food in Iceland consists of water plants (Faber, 1822; Millais, 1913), besides the usual fresh-water shellfish, larvæ of aquatic insects and fish spawn (Slater, 1901; Hantzsch, 1905, 1914; Vanhöffen, 1897; *et al.*).

Stomachs collected on the Pribilov Islands contained mostly amphipods, which constituted 74.1% of the food. Hermit crabs were eaten in the proportion of 11.2%; caddis larvæ (the only fresh-water animals in the lot) 6.4%; mollusks 3%; vegetable matter, 1.6%; and numerous other items of less importance. There were identified nine different species of amphipods (Preble, 1923).

Unusual stomach contents included 140 fresh-water minnows and fragments (*Notropis atherinoides*) found in a dead specimen near Chicago on April 1 (E. D. Hull, 1914), large quantities of wheat in early March in one shot in the Bay of Kirkwall, England, where grain ships were unloading (Harrison, 1919), angleworms and cutworms in specimens taken in Ohio in spring (Haynes, 1900), and little razor-fish (*Siliqua costata*) in Massachusetts in October (Mackay, 1892).

During the very severe winter of 1888–89, flocks of half-starved Long-tails came to the uplands of Nantucket Island, Massachusetts, to feed on the fine dry grass which grew there (Mackay, 1892).

COURTSHIP AND NESTING. Although, like other sea ducks, the Long-tails pair late in winter, it is sometimes possible to see their display activities while they are still on our coasts. The performance is very animated and charming to watch. C. St. John (1878) first called attention to it in the forties of the last century, Nelson (1887) observed it in Alaska, and Riemschneider (1896) and Millais (1913) have recounted their observations in Iceland. Besides much diving, chasing and playing, the males, with tails elevated and vibrating from side to side, continually sound their loud calls and throw back their heads till they almost touch the back while they hold the bill in a vertical position. On the breeding grounds the pursuit flights are very commonly seen. The hard-pressed female sometimes dives and is chased by the males, who continue to follow her over or under the water until she disappears with her chosen mate (Nelson, 1887).

These ducks reach some of their nesting grounds in the Far North long before the sea ice is broken up, feeding in the little fresh-water pools that are shallow enough to feel the effect of the spring sun. They are among the first to search out the open

cracks along the shore, reaching Point Barrow about the middle of May, in Iceland at least two weeks earlier.

They nest invariably on fresh water, usually near the coast, preferring the mouths of rivers or chains of lakes connected with coastal waters to which they can easily lead the newly fledged young. Islands in lakes seem always to be favorite places. In Norway, and in Iceland as well, they often seek out ponds at high elevations, where they arrive before the snow has disappeared.

There is nothing characteristic about the actual nest or its site. It is usually near the water, though sometimes far away from it (Trevor-Battye, 1895) and is placed under thick bushes of willow, birch or juniper when such cover is found. Sometimes each little pool has its own pair which drives out intruders (Murdoch, 1885; Seebohm, 1885) and at other times they nest practically in colonies with Scaup. Shepard (in Baird, Brewer and Ridgway, 1884) mentions an island in Myvatn Lake, Iceland, sixty yards in circumference, on which there were twenty nests.

Nearly everywhere this duck is ranked as one of the latest nesters. In some places eggs are not found much before the end of June or even well into July. May 18 (Faber, 1822) is the earliest date that I have run across for Iceland, and of course the conditions there are unlike those over most of the range. May clutches have also been recorded from Alaska (Nelson, 1887; Einarsen, Murrelet, September, 1922). In most of the far-northern nesting areas late June and the first half of July constitute the regular laying period, and newly hatched broods are found well into August.

The clutch is smaller than that of most sea ducks, and numbers from five to eight, averaging not over seven, although clutches up to seventeen have been recorded (L. M. Turner, MS.).

The eggs are pale grayish green to nearly buff-color and average 54.1 by 38.1 mm. The largest is 58.1 mm. in length and the smallest 51.4. The greatest and least breadths are 39.6 and 36 (Hantzsch, 1914). A slightly smaller average, based on thirty-nine eggs, is given by J. Grinnell, Bryant and Storer (1918).

The down is excellent for use in clothing and considered by some as little inferior to that of the Eiders; but the scattered nesting habits would make it difficult to gather large enough quantities. It is said to be less dark than that of the Scaup or the Scoters.

The incubation period has not been accurately determined, but is reckoned by Hantzsch (1905) at about three and one-half weeks. Mr. Wormald hatched a setting of Iceland eggs for the first time in 1923, and these came out in twenty-four days. Again in 1924 he had some from the same source and these took twenty-six days. It is evident then that the period is not especially long, for of course none of these eggs was in first-class condition. Certainly they were three or four weeks old before they reached England.

Most of the young are reared on the fresh water and they are seldom led away

from the lakes until they are able to fly. This is not always the case, and L. M. Turner (MS.) watched a female with thirteen young only two days old conduct her brood overland to the salt water, half a mile away. Hantzsch (1905) noted the great mortality among the young in Iceland, when, during heavy storms, the females led their broods on to the shore, where the little ones fell into holes in the rocks and became imprisoned.

Males leave the incubating females, but do not always retire to distant regions. Like the Eiders and Scoters the Long-tails do not breed until two years old, and consequently a good many non-breeding males are found on the nesting grounds as well as far south of them.

STATUS. Perhaps this duck is less abundant in some places than it was fifty or a hundred years ago. I have heard such tales near home and give them little weight. Even in my life-time I have seen such changes in coastal waters that I can well understand how wintering sea ducks must shift ground from time to time. I have seen vast areas of black mud or muddy sand, the resting place of migrant shore-birds, grow up to salt-marsh; seen bare sandy brant shoals become grassy islands, islands joined to beaches, and beaches made into islands. With a bird like this a local wintering group may vary from one to a thousand without a particle of change in its status over a hundred miles of coast.

Scarcely any of our American ducks is safer from the hand of man than this one, especially since the season of greatest abundance falls only in the last month of the shooting season. The bird really requires no protection at all and is far better off, on account of its scattered and un-get-at-able nesting grounds, than are the island-nesting Eider Ducks. Its vast numbers and almost universal presence can scarcely be realized by any one who is not abroad in the dead of winter.

ENEMIES. In Iceland the young are followed and sometimes swallowed up by the ever-present Richardson's Skua. Millais (1913) has given a good account of the hunting methods employed by these destructive birds. Manniche (1910), too, speaks of the downy young being preyed upon by Ravens and Glaucous Gulls in north-eastern Greenland. "Between the foxes and the natives, who suck the eggs for food," says W. Palmer (1899), speaking of the Pribilovs, "it is a wonder that the species is so common."

DAMAGE. Very little if any. It seems not to eat edible shellfish such as scallops in New England, or at least only in very small numbers (U.S. Biological Survey, MS.).

FOOD VALUE. This is one of the strongest-tasting of the ducks. It is just about

on a par with the Eiders and several grades worse than the Golden-eyes. I have never eaten young birds in autumn before they have reached the sea, and I dare say they are fairly good for a short season. It seems that a good deal of vegetable matter is taken at that time. They grow worse, of course, as the winter advances, as nearly all ducks, be they plebeian or otherwise, are apt to do.

HUNT. A fair number of Old-squaws are shot from "cooting boats" along our Atlantic coast in autumn. Young birds, singles and pairs, decoy well enough to the flocks of wooden Scoters as they ride the waves a half gun-shot from the lead-colored dory of the sea-shooters. These are mostly young birds, for the "Coot" (Scoter) shooting is nearly over before the main flight of old male Long-tails comes by. A fair number, too, used to be shot from ice blinds built at the edge of open water during hard winters.

Perhaps the best shooting was on the spring migration, when, with Scoters and Mergansers, these birds passed regularly up bays or between islands where they could be intercepted by a line of boats.

A single Long-tail flying low over a choppy sea, furnished, we used to think, the hardest shot of any of the winter duck of New England, Eiders, Scoters, or Golden-eyes. And no doubt he does still provide a good mark, although I have not shot one in many years.

Large numbers of these ducks are killed in northern Germany and in the Baltic countries. They used to be shipped in great numbers to the markets of Hamburg, Berlin, Leipzig and other inland cities (Naumann, 1896–1905). On the coasts of Sweden vast numbers are said to be shot by the peasants in spring, either by watching for them in the open places in the ice, or by putting out stuffed decoys. It is not unusual for one man to shoot three hundred or more during the spring flight, and as many as six hundred to eight hundred have been taken, all killed with a pea-rifle (Dresser, 1871–81).

Mention should also be made of the Swedish practice of taking these and other sea ducks in standing nets, stretched across narrow sounds between islands. These nets, which are about thirty feet high, are so arranged that they can be dropped into the sea the moment the wild-fowl enter the meshes (Macpherson, 1897). Another method of netting Long-tails, resorted to in Sweden, is to sink fishing-nets through holes in the ice, placing them in a "zigzag position along the holes on the bottom." The ducks get entangled when diving for food (Dresser, 1871–81). On the North Sea coast of Germany both horizontal and vertical nets were used in taking Long-tails for the market.

Wherever winter fishing is carried on to any extent a good many of these ducks get accidentally caught and drowned in the nets. In 1917, Mr. W. E. Saunders investigated reports of very unusual numbers of Long-tails and other ducks taken on

the west end of Lake Erie. At Rondeau he found that no less than twelve tons (calculating 1500 ducks to the ton) had been conveyed to the fertilizer factory. Of these some were already dried and powdered, others were in process, and thousands were on the floor waiting their turn. Mr. Saunders was told that every year the fishermen catch Long-tails by the dozens or the hundred, but the total numbers are, as a whole, negligible. No such slaughter as the one just mentioned had ever been seen before. For some reason or other this species seems particularly liable to be taken in deep gill-nets, probably because the other ducks, like Golden-eye, Buffle-head or Scoters, do not dive so far.

Behavior in Captivity. Although adult birds of this species have often been kept in captivity they usually die in a few months and ordinarily before they have time to go through a moult. Mr. Blaauw told me that some of his specimens had gone far enough to almost assume the black plumage of summer, but he never had any real success with them. Mr. Wormald never tried to keep his, although he acclimatized a few and got them "on feed." I believe that Mr. St. Quintin was the first to rear Long-tails from wild-gathered eggs, sent him from Iceland. He succeeded in rearing them to maturity and they lived till mid-winter, but none of them lasted a full year.

In 1923 Mr. Wormald received eggs from Iceland and these came out in twenty-four to twenty-five days. They hatched on July 22 and showed continuous growth up to August 20 (seventeen ounces) and after that they remained at a nearly constant weight until August 30. The tail and mantle feathers appeared about August 6 and on the 26th they would have flown if they had not been pinioned. The little ones were put out under a bantam the day after they hatched and were allowed access to a shallow, circular cement tank in which there were placed fresh-water shrimps and small snails while ants' "eggs" and dried flies were floated on the top. Almost at once they began diving for the shrimps and ate a little meal off the edge of the tank but they would not pick it up at the hen's call. Afterward they were found to take maggots best and not to be at all partial to ants' "eggs" and dried flies, although some little Scaups in the next pen ate them well. It was found a good plan to mix the maggots with a prepared meal. On the 28th, chopped angleworms were added to the diet. In spite of rather cold, wet weather this brood got along fairly well but they did not get thoroughly "water-proofed" until they were eight days old.

In 1924 Mr. Wormald hatched some more Long-tails and I had the pleasure of seeing them in July. He afterward wrote me that owing to a bad, rainy season he lost all of these, although this same summer he had fourteen young Scaup, nine Barrow's Golden-eye and three Harlequins, a remarkable achievement.

Thienemann (1903), who kept some alive through a whole summer, made some interesting observations on plumage changes and feeding habits. In a clear pond

they swam close to the bottom and never collided with the fence-wire or other obstacles. They never used their wings under water (perhaps because they were pinioned) and usually stayed under about half a minute. When they wished to stay under for a longer time they had a way of expelling the air from their feathers, which caused a stream of bubbles to come up behind them. He fed these birds and some Black Scoters chopped-up fish, of which they much preferred the salt-water kinds. The food which they picked up on bottom they "sucked in," rarely bringing any to the surface. They became extremely tame and learned to know their keeper. When the latter approached them they showed their hunger by frequent diving, and sometimes uttered a soft entreating *wak*. These birds never came to the shore while healthy. Only after he had to omit the salt-water fish from their fare, did he begin to notice that some of the feathers of the posterior parts were wet and the birds began to come to shore.

Hybrids. None recorded.

HARLEQUIN DUCK

HISTRIONICUS HISTRIONICUS (LINNÉ)

(Plate 70)

SYNONYMY

Anas histrionica Linné, Systema Naturæ, ed. 10, vol. 1, p. 127, 1758.
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Additional synonymy under Geographical Races.

VERNACULAR NAMES

English: Harlequin Duck, Lord and Lady, Painted Duck, Mountain Duck, Rock Duck, Squealer, Collar Duck, Glacier Duck, Circus Duck, Sea Mouse, Wood Duck.
German: Kragentauchente, Kragenente, Harlekinente, Stromente, Zwergente, Lättentlein, Narrenente, Hanswurstente, Kanuschka.
Dutch: Bonte Duiker.
French: Canard histrion, Garrot histrion, Harelde histrion, Canard arlequin, Garrot arlequin, Histrion arlequin, Canard à collier, Histrion à collier, Canne de roche.
Italian: Moretta arlecchino, Moretta col collare.
Faroese: Brimondt.
Norwegian: Strömand.
Danish: Strömand.

Swedish: Strömand, Harlekinsand.
Icelandic: Straumönd, Brimdufa, Brimönd, Harlekong.
Polish: Kaczka vrorzysla.
Croatian: Patka šarkica, Šarena norka.
Finnish: Virta-alli.
Russian: Kamenushka, Kamennaja utka, Saksonka, Chernaja polossataja utka.
Czech: Kachna strakatá.
Amur Tribes: Sjom, Momera.
Greenland: Tornauiarsuk.
Alaska Eskimos: Ti-tä-tsik.
Labrador Eskimos: Ingiuliksiut, Ingiuliksiutik.
Japanese: Shinorigamo, Okinokencho.
Kamchatkan: Niking, Nikingyk.

DESCRIPTION

Adult Male, winter: General color of upper side rich bluish slate, interrupted by sharply contrasted white patches. Ground color of the sides of the head, neck and throat, purplish black, while a crown stripe of jet black extends from the bill back to the occiput. On either side the crown-patch is bordered in front by a narrow white line, and behind by a rich chestnut stripe. Three white patches show prominently upon the face: at the base of the bill is a broad triangular one of white, another round spot is situated on the ear-coverts, and still farther back on the sides of the neck is a white band. A white collar, narrower underneath, and interrupted along the middle line above, separates the neck from the body plumage. The slate-blue mantle color is continuous with the color of the upper breast but on the side of the breast is a broad crescentic white patch bordered with black. There is a conspicuous longitudinal white patch along the middle scapulars, while the back, rump and upper tail-coverts shade off into deep purplish black. Tail black, with purplish reflections, and the central tail-feathers longer than the rest. Abdomen brown, darker posteriorly. Under tail-coverts purple-black like the upper ones, with a small white spot on each side near their bases. Flanks bright chestnut. Wings slaty gray, with the speculum metallic purple, and the inner secondaries mostly white. There are also one or two white-spotted feathers among the wing-coverts and a short white band at the tip of the greater coverts. Under side of wing brown; axillars brown.

Iris dark brown to reddish brown. Bill with a small membranous lobe at edge of maxilla overhanging rictus in fresh specimens; bluish gray, with the nail yellowish or horn color. Legs and feet varying from pale gray to grayish brown and with the webs black.

Wing 198–210 mm.; bill 24–29; tarsus 34–39.

Weight 1 pound, 8 ounces (0.68 kilograms).

Adult Female, winter: General coloration uniform dull brown all over the upper side, head, neck and upper breast. On the sides of the head are three white or whitish patches: one small one just above and in front of the eye, one large irregular one below and forward of the eyes and a third on the ear-coverts in the same position as in the male. Lower breast and abdomen brown but mottled and sometimes roughly barred with whitish, giving a general dirty-white appearance. Under tail-coverts rusty brown. Wing blackish, and without the purple speculum of the male.

Iris dark brown. Bill dark plumbeous with edges toward tip whitish. Legs and feet ochreous olive, webs black.

Size smaller. Wing 185–197 mm.; bill 23–26; tarsus 33–36.

Weight about 1 pound, 4 ounces (0.50 kilograms).

HARLEQUIN DUCK

Juvenal Male

Immature Male

Adult Male

Eclipse Male

Adult Female

Juvenal Female

Male and Female in First (Juvenal) Plumage: Almost like adult female in winter but inclined to be a little lighter in color on the mantle, scapulars and rump, while the tail-feathers are always blunted at the tips. Sexes not easily told apart until November or December as a rule, although as in most ducks there is much variation in the assumption of secondary sex plumage in the male.

Iris dark brown. Bill dark plumbeous, like that of the adult female. Legs and feet olivaceous ochre, with webs and back of tarsi black.

Immature Male: Changes leading to adult plumage begin in November or December and last all winter, the birds of the year never reaching full plumage until their second winter. Probably they are not in the acme of perfection until their third winter. The first changes, which may be seen in the young male as early as October, or perhaps not until late November, start with new dark feathers coming in upon the head and neck, but such a change may be slow at first. Later the process of moult spreads to the sides of the breast, mantle, scapulars and flanks but the immature appearance of the lower parts is carried throughout the first winter. Specimens with an almost adult head-coloring may be found as early as late November. The juvenal wing with the dull speculum easily identifies all males of the first winter and spring, no matter how far advanced the rest of the plumage may be.

Male in Eclipse: This very distinct plumage is quite different in appearance from the female plumage. The general coloring is blackish brown but with more or less of a lead-blue cast to the mantle and scapulars. The lower parts are dingy black, not mottled whitish and brown as in the female. All the white markings of winter plumage are eventually lost except the anterior face-patch and the round ear-patch. The wing retains the brilliant speculum of the adult male. Young males in first eclipse can be distinguished from adult males by the juvenal mottled appearance of the lower parts and the absence of the purple speculum. This plumage is assumed late in the Harlequin and although some may start to change early in July, complete eclipse specimens seem to be rare until late August. The change back to winter plumage is then a rapid process.

Young in Down: Upper parts uniform brown with poorly defined whitish patches on wings and scapular regions, but none on sides or rump. Lower parts white, the white sharply defined on head and neck. There is a characteristic light spot just above and forward of the eye. This species can be distinguished from the young of the Long-tailed Duck by the presence of white patches on the wings and scapulars.

DISTRIBUTION

The Harlequin is one of the rarer arctic ducks and little definite information is available as to its breeding areas. This is partly due to the fact that these ducks seek rather secluded places for their nests and also because many of them, presumably the younger birds, do not breed. Furthermore, the female is an obscure-looking bird that is probably frequently overlooked or wrongly identified.

Breeding Range

The regular nesting areas of the Harlequin are scattered all the way from eastern Siberia through North America to Greenland and Iceland. In Asia as in America it shows a preference for the fast mountain streams. Radde (1863) found it not rare about Irkutsk in summer, and Dybowski (*fide* Taczanowski, 1893) found it nesting in Transbaikalia. Maak (1859) speaks of it as common about Lake Baikal and along the Amur, and von Schrenck (1859) also met with it along the latter river and took nests near the mouth of it. On the Ussuri, specimens have been taken from May until September (Buturlin, 1915) and northward throughout the Stanowoi Mountains, as well as on the coasts of the Sea of Ochotsk it is fairly common after May 20 (A. T. von Middendorff, 1853). J. A. Allen (1905) also states that it is not rare on the coast and that it is said

Eastern Siberia

to nest at Ovecho and Marcova. In the interior it probably nests as far north as 65°. Von Bunge and von Toll (1887) noted it on the Lena below Yakutsk and Buturlin (*fide* Dresser, 1908–09) found it in the Werchojansk Mountains.

Specimens and eggs have been taken at Chaivo and Chipesani, Saghalin (Lönnberg, 1908; Hesse, 1915) and on the Kuriles the species is said by Stejneger (1898) to breed abundantly. Steller (*fide* Pallas, 1831) found it a common nesting bird in Kamchatka, but von Ditmar (1900) says it is only a migrant there. Specimens have been taken throughout May in southeastern Kamchatka (W. S. Brooks, 1915), and in summer on the Commander Islands, where, however, the species does not seem to nest (Stejneger, 1885; Hartert, 1920).

Saghalin
Kuriles
Kamchatka

The Harlequin is very common on the Aleutians in summer, but few if any nest (Unalaska?) (Dall, 1874; L. M. Turner, 1886; Nelson, 1887; R. C. McGregor, 1906; A. H. Clark, 1910; Bent, 1912). On the mainland it is a rare bird along the coast from the mouth of the Yukon to Kotzebue Sound (Nelson, 1887) though a few nest along the tributaries of the Yukon and along the upper Yukon itself (Dall and Bannister, 1869; Bishop, 1900; Blackwelder, 1919). In Bering Sea it has been seen on St. Matthew's in July (G. D. Hanna, 1917) and on the Pribilovs it is common (Coues, 1875; W. Palmer, 1899), probably not breeding. In southern and southeastern Alaska it is quite abundant in summer, even breeding to some extent. Osgood (1904) found it common about the base of the Alaska peninsula, and Gianini (1917) met with some numbers in summer at Stepovak Bay. Bretherton (1896) says the species nests on Kadiak Island, and it certainly does so on Hinchinbrook Inlet and on the Montague Islands (U.S. Biological Survey). F. M. Chapman (1904) has recorded it from Bird Island late in July, and Loring (1902) from Knik River in June. In southeastern Alaska it is common at Sitka and nests (?) in the vicinity (J. Grinnell, 1898; Willett, 1914; A. M. Bailey, MS.).

Aleutians
Alaska

In Yukon Territory and northern British Columbia, C. Sheldon (1911) and Swarth (1922) have reported it quite common on the upper Stikine and in the Pelly Mountains, where it has been found nesting near Dawson, at White Horse Rapids and on the Pelly Lakes, as well as near Telegraph Creek on the Stikine (U.S. Biological Survey). It is rare on the Queen Charlotte Islands, but has been found nesting on the Bear River, Vancouver, and is said to do so along the coast of British Columbia also (Fannin, 1891; Kermode, 1904). In the interior of British Columbia, A. Brooks (1917) took nests in the Chilliwack region, but found it a scarce summer resident in the Cariboo district. Eastward, in the Rockies, nests have been taken on the Alberta border at Hector (J. and J. M. Macoun, 1909), near Banff (Spreadborough, *fide* J. and J. M. Macoun, 1909), and on the Athabasca and Smoky Rivers (U.S. Biological Survey) as well as in Jasper Park (Taverner, U.S. Biological Survey).

Yukon
British Columbia
Alberta

There is no very good evidence that the Harlequin nests anywhere in the MacKenzie and Athabasca basins. R. M. Anderson (1917) has recorded specimens taken at Barter Island on the Arctic coast of Alaska in June, and others from Herschel Island and MacKenzie Bay. Indeed, Raine (1892) says he has eggs sent him by missionaries from the mouth of the MacKenzie (!) and C. A. Reed (1904) lists a clutch supposedly taken on the Peel River. This is all the evidence available at present, though the species has been seen or taken about La Pierre House, Great Bear Lake, Fort Simpson, Fort Rae, Lake Hardisty, Fort Resolution, Fort Halkett (*fide* Baird, Brewer and Ridgway, 1884; Frank Russell, 1898; Preble, 1908) and farther south at Chipewyan and Lake Claire (Harper, MS.) as well as along various tributaries of the Athabasca (Spreadborough, *fide* J. and J. M. Macoun, 1909). A specimen has also been recorded from York Factory (Blakiston, 1863).

MacKenzie
Athabasca

In the western States of the Union the Harlequin is very common in summer on some of the islands of Puget Sound (W. L. Dawson and Bowles, 1909; Edson, 1908) but these appear to be non-breeding birds. Some are said to breed in the Cascades (W. L. Dawson and Bowles, 1909) and in the Olympic Mountains downy young have been seen (U.S. Biological Survey). D. G. Elliot (1898) has recorded a nest from Wenatchee on the upper Columbia. Pos-

Western United States

MAP 95. Distribution of Harleq

Breeding range, dotted li
Sporadic records ir

uck (*Histrionicus histrionicus*)
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ll by crosses (×)

MAP 95. Distribution of Harlequin Duck (*Histrionicus histrionicus*)

Breeding range, dotted line; winter range, broken line
Sporadic records indicated by crosses (×)

sibly some breed in the mountains of Oregon, but there is no evidence of this available. Small numbers are, however, known to nest in the Sierra Nevada of central California (Belding, *fide* J. Grinnell, Bryant and Storer, 1918). In the Rockies the species nests to some extent in Montana near Billings (Birdseye, U.S. Biological Survey) and particularly in Glacier National Park (F. M. Bailey, 1918; A. A. Saunders, 1921), in Wyoming (Grave and Walker, 1913; T. S. Palmer, 1913) and as far south as San Juan County, Colorado (W. L. Sclater, 1912; *et al.*).

In eastern North America this duck is occasionally seen about the northern parts of the Gulf of St. Lawrence (Schmitt, 1904; Comeau, 1909; C. W. Townsend, 1920) but Audubon's account of its nesting at Grand Manan and the Bay of Fundy is incorrect (the nests found were apparently Red-breasted Mergansers'). It is said to breed in Newfoundland (Merriam, 1883; Reeks, 1869), though the evidence is not convincing (Millais, 1913). There is a specimen in the United States National Museum taken on James Bay early in June, and Todd (MS.) has found the species breeding on Lake Manuan in northern Quebec. I presume that a few may nest near the east coast of northern Labrador, for it is said to remain all summer at Nain (Schmitt, *fide* C. W. Townsend and Allen, 1907), and is a not rare breeder about Port Burwell and along the east shore of Ungava Bay (Hantzsch, 1908). F. F. Payne (1887) found it common in Wales Sound on Hudson Strait in June, but says they disappeared after that date.

Eastern Canada

Newfoundland

Both Kumlien (1879) and Hantzsch (*fide* Hesse, 1915) have recorded specimens from Cumberland Sound, Baffin Land, but so far we have no certain evidence that the species breeds there. But in Greenland it probably nests along the whole west coast to a high latitude. Chamberlain (1889) says it is seen in summer in southern Greenland and probably breeds at Arsuk, while Winge (*fide* J. and J. M. Macoun, 1909) say it nests at Godhaven, Uestfjord and a number of other localities. Kumlien (1879) found it not uncommon at Godhaven. Other explorers have met with it at Sukkertoppen, Niakornat (F. M. Chapman, 1899), Ivigtut, Holsteinborg and Upernavik (U.S. Biological Survey). The northernmost records are for Olrik Bay, where the species was found breeding (F. M. Chapman, 1899) and Robertson Bay (77° 40′ north latitude) where a flock of twenty was seen in August (L. Gibson, 1922). On the east coast it occurs about Angmagsalik (Helms, 1904) and has been found breeding as far north as Scoresby Sound (*fide* Schalow, 1905).

Baffin Land

Greenland

In Iceland the Harlequin is a fairly common breeding bird in many localities, being perhaps less abundant in the south than elsewhere (H. J. and C. E. Pearson, 1895; Slater, 1901; Hantzsch, 1905; Millais, 1913; *et al.*).

Iceland

Winter Range

The Harlequin does not move far south to spend the cold season, and in many places is practically a resident bird. In eastern Asia it has been taken as far south as Fusan, Korea (A. H. Clark, 1910) and about Vladivostok it is said to be not rare (Bolau, 1880; Dörries, 1888). In Japan it has not, so far as I know, been taken anywhere south of Yokohama and Tokyo (M'Vean, 1878; Blakiston and Pryer, 1882). Whitely (1867) has recorded it from Hakodadi and on the Kuriles it is common (Seebohm, 1890). It winters also on the Commander Islands (Stejneger, 1887; Hartert, 1920).

Eastern Asia

On the Aleutians (L. M. Turner, 1886; Nelson, 1887) and on the Pribilovs (Coues, 1875) it is abundant in winter and the same is true of southern and southeastern Alaska (Hartlaub, 1883; Willett, 1914; L. Littlejohn, U.S. Biological Survey). Specimens have been taken on Vancouver Island in December and January (Taverner, 1917) and I presume along the coasts of British Columbia. It is a rare bird on Puget Sound in winter (Edson, 1908; Rathbun, 1915) and only very few are taken each year at Yaquina Bay on the Oregon coast (Woodcock, 1902). In California it has been taken or seen in winter as far south as Monterey and Piedras Blancas, San Luis Obispo County, but there are only very few records of its occurrence

Aleutians

Alaska

Pacific Coast

at all, most of them for the northern parts of the State (J. Grinnell, Bryant and Storer, 1918; J. Grinnell, 1922).

Interior

In the interior a few winter occasionally about Fort Sherman, Idaho (J. C. Merrill, 1897) and in Colorado (W. L. Sclater, 1912), while stray specimens have been taken near Mandau, North Dakota, January 23, 1912 (*fide* Hartert, 1920a), in Nebraska, September (Bruner, Wolcott and Swenk, 1905), two in winter near Kansas City (H. Harris, 1919), a few in winter in Missouri (Widmann, 1907) and a few in Iowa (R. M. Anderson, 1907). About the Great Lakes it is more frequently seen. Hatch (1892) gives a few instances of its occurrence on Lake Superior in winter and Kumlien and Hollister (1903) state that it has been taken at Milwaukee and Racine, Wisconsin. It is occasionally taken in northern Illinois (Nehrling, 1885; Ridgway, 1895) and once on the Michigan side of Lake Huron (Covert, *fide* Barrows, 1912). So far as I know it has never yet been taken in Indiana, Ohio, or western Pennsylvania, though it has been shot at Buffalo and on the Niagara River in western New York (Eaton, 1901).

Great Lakes

Atlantic Coast

On the Atlantic coast the Harlequin is found in winter in some numbers on the south and west coasts of Newfoundland (Millais, 1913), and probably on Anticosti, too (Brewster, 1884). It used to be common in Nova Scotia (Langille, 1884; Downs, 1888) and especially on the Bay of Fundy (Dresser, 1871–81) but is now very rare (H. Piers, *in litt.*). On the coasts of Maine, it has now become a rare bird (O. W. Knight, 1908; G. M. Allen, 1909; *et mult. al.*), but specimens are still occasionally taken in Massachusetts and as far south as Rhode Island (Hathaway, 1913), Connecticut (Bishop, 1921) and Long Island (Eaton, 1901). According to W. Stone (1909) it occurred rarely even in New Jersey, and Wayne (1918) says he saw four or six during a severe cold spell on January 14 and 16, 1918, off the coast of South Carolina. According to Cooke (1906) a specimen was noted on March 20, 1886, near Pensacola, Florida!

Greenland Iceland

Mr. Schiöler writes me that the Harlequin winters to some extent along the southern shores of Greenland. It winters also in Iceland, especially seeking the more southerly coasts during the cold weather (Hantzsch, 1905; Millais, 1913; *et al.*).

European Occurrences

The Harlequin has from time to time been taken in Europe. Specimens from the British Isles have been recorded over twenty times, but after critical investigations (notably by J. H. Gurney, Jr., 1876) only the following four have been accepted as authentic by Millais (1913) and Witherby *et al.* (1919–22): one male from Filey, Yorkshire, autumn, 1862; two young males out of three seen, Farne Isles, Northumberland, December 2, 1886; another, said to be the third of the preceding company, also from Farne Isles.

The species, curiously enough, seems never to have occurred in Norway. Millais (1913) says there are specimens in the Bergen and Christiania Museums, but these must have been imported, since no records are given in the exhaustive check-list of Schaanning (1913). In Sweden specimens have been taken at Claëstorp in eastern Vingaker in 1862 and at Carlskrona in 1893 (Westerlund, *fide* Millais, 1913). Mathey-Dupraz (1912) has reported a pair taken in July, 1906, at Advent Bay, Spitzbergen. H. J. Pearson (1904) makes a vague statement that it has been recorded in autumn and winter from the coast of Russian Lapland, but the only definite record I can find is that of two specimens taken in July, 1856, at Kem on the west coast of the Gulf of Onega. I do not know on what evidence Seebohm (1882a) bases his statement that it is rare at Archangel in summer, and I think the assertions of Pallas (1831), Eversmann (*fide* Seebohm, 1885) and Harvie-Brown (1878) that it is rare in the Urals, but breeds in the Jaroslav Government must be ignored, as resting on mistaken identification. I have been unable to trace the origin of the oft-repeated statement that it is found on the Caspian and Aral Seas in winter. None of the more recent investigators have met with the species, and the region seems a very unlikely one.

Floericke (1898) tells us that he found young Harlequins every year in November on the Kurische

Nehrung, eastern Prussia, and that the bird had simply been overlooked in the past. This statement is regarded as unworthy of belief by Hartert (1920a). Of numerous other records of its occurrence in Germany only the following seem to be at all trustworthy: two in the Berlin Museum marked "Pomerania" (Hesse, 1915a); one taken near Lubeck, Holstein (Journ. f. Ornith., vol. 26, p. 433, 1878); one found in the market at Karlsruhe, February 28, 1889 (W. and T. Heussler, 1896); one taken near Freising, Bavaria, September, 1893 (von Besserer, 1894); one taken at Gerolzhofen in northern Bavaria (Kress, *fide* Naumann, 1896–1905).

Kjärbölling's (1850) remark that the species occurs on the North Sea coast of Denmark and Dubois's (1886) note that it straggles to the Belgian coast in severe winters are too indefinite to be of value. Paris (1907) gives records of its occurrence at Gravelines, Dunkirk, in the eastern Pyrenees and at Rivesaltes in the Pyrenees, and Rogeron (1903) tells us that the Angers Museum has five or six specimens taken in that vicinity. According to Vayreda y Vila (1883), it has been known to occur in severe winters in the province of Gerona, northeastern Spain. The only record of its occurrence in Italy is of a flock of ten which appeared on March 2, 1902, in the province of Venice, some of which were shot (Falconieri di Carpegna, 1902). A specimen is also said to have been taken in the Tyrol (Tschusi, *fide* Dresser, 1871–81). In Switzerland it seems to occur somewhat more frequently on the lakes north of the Alps. It has been taken on Lakes Constance, Zürich and Morat, and there are about six instances (one a summer occurrence!) of its appearance on Lake Geneva (Fatio, 1904). A specimen taken at Göding, Moravia, on February 28, 1867, is in the Vienna Museum.

Migration

The Harlequin is essentially a resident species and it may be that only the females and young move south at all in the autumn. At any rate the seasonal movements are so local that little can be said about them. Many of the mountain-breeding birds simply pass down the streams to the coast in winter. This seems to be the case in most localities and even in Iceland the seasonal movements are purely local. On our Atlantic coast, where there is more evidence of real migration than elsewhere, the Harlequin comes late, generally in November, and leaves early, generally in February and sometimes in late January. But it seems to move very slowly and does not reach its breeding grounds until well into May or even June.

GENERAL HABITS

I am ashamed to admit that I have only twice seen this remarkable and interesting duck alive. Once while traveling near Lake McDonald in what is now part of Glacier National Park, Montana, I surprised a little brood two-thirds grown in a small stream. Jumping off my horse I managed to catch one under water (so small and shallow was the brook) as the female led them down a little ripple of water only a few inches deep. Another, a single old male, I saw many years ago just beyond the breakers on the outside of Monomoy Beach, Cape Cod (Massachusetts), in January, where, of course, the species is and always was very rare. So tame was this bird that I could easily have shot it, but there was no way of getting it had I done so, and it went unscathed.

No doubt this is one of the most remarkable in many respects of all the sea ducks. It has no particular resemblance, either in appearance, habits, distribution or structure to any other group. The striking and almost grotesque color-pattern makes the old male a marked bird wherever he is seen, but the females and immatures

can easily be confused with the Golden-eyes, the Scoters or even the Buffle-head. The bizarre spots and patches have led to various highly theoretical attempts at an explanation, but *attempts* only, in my opinion.

Its habitat is as remarkable as the bird itself. Instead of favoring the open feeding grounds occupied by Eiders, Scoters, Long-tailed Ducks and others in winter, it hugs closely the roughest, rockiest shores of headlands and outer islands where the surf breaks over hidden ledges. The more exposed the place the more popular it seems to be, and all who have seen them have marveled at their powers of calculation in outwitting the force of the heaviest waves. But in summer the breeding pairs merely exchange the neighborhood of breaking surf for the most boisterous mountain streams, where they are perfectly at home amid the spray of waterfalls, in rapids and among rocks.

In Alaska, the Yukon Indians had a habit of taking the skins of the males, of stuffing them, decorating them with beads and cloth and giving them to the children as toys (Nelson, 1887). When Turner (MS.) was collecting in Alaska he noticed that the natives of Attu Island tried to dissuade him from shooting these ducks, saying that the flesh was not worth the ammunition. Turner suspected that there was some superstition about this, for he never could elicit from the natives a satisfactory explanation of their attitude.

In working up the older literature of this bird in our West one must be careful not to confound the Harlequin with the Carolina Duck. A good many references to Carolina Ducks in the Rocky Mountain region of our West really have to do with Harlequins. An old English writer, Briggs, reported the breeding of Harlequins in captivity some seventy-five years ago, but his birds were afterward found to have been Carolinas.

Wariness. No matter where found Harlequins are easy to approach on land or sea. Their habit of traveling in compact little flocks makes them an easy mark when on the wing, and their "packing" on the water usually makes a shot all too effective. Sometimes L. M. Turner (1886) noticed that they would merely open ranks and allow a canoe to pass between without getting up. In Labrador he noticed them squatting flat on the rocks near the water, endeavoring to escape detection. Sometimes they would not fly, even though his kayak passed within a few feet of them (Turner, MS.). Millais (1913) reports similar behavior in Iceland, where the males after the nesting season showed a disposition to hide, crouching behind rocks even before the flight feathers had been dropped. No doubt their trustful disposition has had something to do with the reduction in their numbers on the North Atlantic coast in the last fifty years. Those which used to congregate on the outer islands off Maine are said to have easily fallen victims to the boy shooters. When Norton was hunting Harlequins on the Maine coast in the winter of 1894 he several times noticed that

a little group responded immediately to the guttural warning notes of the Black-backed Gulls, leaping directly to wing without a pause. He thought that the cry of these gulls was actually of some use to the ducks, at least as a protection from man.

Nelson (1887) found that Harlequins became shy in May, just before the breeding season. A few other observers (Dresser, 1871–81; Alford, 1920a) have referred to it as a shy bird, but taken by and large, wariness is certainly not a distinguishing trait of the species.

Daily Movements. The Harlequins feed almost entirely by day, like the Golden-eyes and the Eiders, coming in to their favorite ledges and rocky coves in the morning. W. Palmer (1899) speaks of their coming in regularly at 7 P.M. to roost on the rocks on the Pribilov Islands.

Gait. This duck is just as much at home on the rocks as on the sea, and does not show any of the awkwardness in walking that is characteristic of the Scoters or the Eiders. It takes advantage of rocks in streams for perching, and young broods have even been found sitting in a row on a fallen tree lying partly in the water.

Swimming. Harlequins tend to pack together very closely on the water and they also have a habit of swimming in step-like or *échelon* formation. Alford (1920a) describes this in the following way: Each individual swims closely behind and slightly to one side of his leader, with the females in the rear or at least in a different part of the line. "By a sudden turning movement, the group will form into a line and swim along side by side, and so bunched together that the flank of each individual touches that of his neighbor."

The individual bird floats high on the water and its extreme buoyancy has been remarked upon by almost every one who has had a good chance to see it. It has a habit of swimming with the head jerking backward and forward as an accompaniment to each stroke of the feet.

The identification of the female when on the water is by no means an easy matter. As Griscom (1922–23) says, the two light face-spots of the Harlequin are very poor field-marks and it is easy for the over-enthusiastic to confuse it with the young Long-tail or Scoters in various immature plumages. The buoyant floating position, the short stubby bill, the very dark back and the absence of white on the abdomen, as well as the aloofness in regard to other species usually serve to identify it.

Diving. Harlequins are not true deep-water diving ducks. They much prefer to feed in rough water that is broken by rocks and surf, and they will even feed in shallow streams where they can walk along the bottom and secure food by dipping down and merely immersing the head. Their great buoyancy seems to make diving a greater effort, but is no doubt a useful adaptation. They use their wings half-

opened under water. Indeed this partial use of the wings is quite characteristic of the species. It has been noticed both in the field and on private ponds. Mr. Frank W. Benson told me that while watching one on a clear stream in Wyoming at a distance of only a few feet he could see it moving its wings while under water in quick jerks, all the time holding them near its sides. It never extended its wings as it would in flying.

As L. M. Turner (1886) says, they usually feed near the shore, searching the shallow pebbly places. "When a breaker comes over them, they dive until it passes. At Attu I have seen them dive before a breaker struck them, and in such shallow water that I often wondered how they held on, as they came up at times not a foot from where they went down." Norton has given an excellent description of their behavior in the winter home on the coast of Maine. "The Harlequins," he says, "were attracted to the largest billow, one which surged high and sharp and broke about fifty yards from the reef, where its force was spent. For considerable intervals the ducks would sit facing the wind, but not advancing, slightly removed from the fury of the breaker. Then drawing nearer to it they would dive to feed. Frequently all would be under at once, but this diving seemed to depend slightly on the action of the sea, as a portion of the flock, apparently not ready to dive, on being threatened by a breaker, would plunge into it, only to rise after some time had elapsed. After a few plunges they would rest on the surface of the water, usually in the path of the great breaker, apparently in mere wantonness. Now they were in little groups scattered parallel with the length of the wave, awaiting the rushing flood. . . . As it rushed over the inequalities of the bottom its crest began breaking at corresponding intervals. High above them it topped, and as its crest broke in white foam, the little ducks plunged headlong into its front, almost instantly reappearing in its train, while perhaps others a few feet from them, with unerring calculation, would ride over an unbroken part as lightly as bubbles."

As Harlequins usually feed in shallow water they generally make only short dives, from ten to twenty-four seconds, as actually timed by Alford (1920).

Flight. It is characteristic of the Harlequins that they fly in small and very compact flocks. So closely do they pack, says Turner (MS.), that sometimes more than half of their number can be killed at one shot. They are very swift and active on the wing, and when living on small streams they habitually follow every little bend in its channel, never passing over the smallest tongue of land if they can help it. The sharp-pointed wings are beaten swiftly and the bird swings from side to side even more frequently than the Long-tailed Duck (Millais, 1913). Several writers (A. M. Bailey, MS.; Dresser, 1871–81; etc.) have noted that they often dive directly into the water if fired at while on the wing. In some places they even seem to prefer diving to flying in order to escape danger.

Although flocks are usually small they do, in winter, occasionally gather into considerable bunches. W. Palmer (1899) frequently saw as many as 150 together on St. Paul Island, Bering Sea, and W. L. Dawson and Bowles (1909) mention a flock of five hundred on Puget Sound.

Association with other Species. Many naturalists have observed the independent disposition of the Harlequin and its distaste for the companionship of other ducks. This is true not only on the coastal haunts but also on the interior breeding grounds. At times, however, they drift about in the company of Long-tails, but such association is not characteristic.

Voice. As a rule the Harlequin is a silent bird, but several different sounds have been attributed to the male. The typical courtship note, which is also heard in winter, is a peculiar whistle which the fishermen of Maine liken to the squeaking of a mouse (Norton, 1896). Alford (1920) says the "low piping whistle" more nearly resembles the call of the Sandpiper than any note he has ever heard. Bretherton (1896), who observed these ducks on Kadiak Island, Alaska, describes the male's cry as a "shrill whistle, descending in cadence from a high to a lower note, commencing with two long notes and running off in a trill." An apparently different spring note, consisting of a low *giäk* or *giä*, is spoken of by both Faber (1822) and Hantzsch (1905).

The ordinary call of the female is a harsh croak, but this note is modified in various ways. On the breeding grounds a note sounding like *ek-ek-ek-ek* or *gäg-gäg-gäg* has been heard and both Faber (1822) and Hantzsch (1905) assign the *giäk* call to the female as well as to the male.

The trachea was first adequately figured by Alfred Newton (1859), but was earlier described in Audubon's Ornithological Biography (vol. 5, p. 617, 1839). It has several peculiarities and certainly shows little if any relationship to that of any diving duck. There are two enlargements in the tracheal tube itself, one a moderate one in the upper part followed by a constricted portion below. Then just above the bifurcation is a larger swelling about half an inch in diameter, which terminates in the very large, left-sided tympanum, which is remarkable in not having any of the membranous windows common to all the other diving ducks except the Eiders. (In the Scoters, as Newton remarks, there is nothing that can properly be called a tympanum or *bulla ossea*.)

Food. The diet of this duck is, of course, almost entirely of an animal nature. Usually the shellfish it takes are small but I have seen some spiral shells from 15 to 20 mm. long taken from the stomach of one shot in Maine in winter. Besides mollusks of various kinds, isopods, crustaceans, caddis-fly larvæ, and the larvæ of many

other insects are taken in summer. Vegetable matter is mentioned by a few writers, but it probably is not an important part of the whole.

Examination by our Biological Survey of 22 stomachs of the Harlequin Duck taken in British Columbia and Alaska from November to April shows that the species is almost exclusively carnivorous. Vegetable matter (algæ) amounted to less than one per cent of the total contents of these stomachs. The most important food items were mollusks and crustaceans. Of the former both bivalves and univalves are taken and no fewer than 165 of the latter were found in a single stomach. The mollusks with jointed armor, known as sea-slugs (*Chitonidæ*) are freely taken. Of the crustaceans, water-fleas (*Amphipoda*) predominate, but crabs including hermits are often eaten. Barnacles also rank high in frequency of occurrence. The sea-loving Harlequin gets representatives of various other groups of marine organisms, including hydroids, sea-spiders, bryozoans, sea-urchins, foraminifera, and tubicolous worms (W. L. McAtee, MS. notes).

There are, of course, many other references to food habits; thirty-nine small shells (*Columbella luneata*) and several small *Littorinæ* were found in one stomach (Whitfield, 1894). L. M. Turner (1886) found that shellfish of all kinds, but especially the common black mussel (*Mytilus edulis*), were taken in Alaska. In the same region Belding (J. Grinnell, Bryant and Storer, 1918) found them feeding on isopod crustaceans, gathered under stones on the beach. The summer food in Iceland is comprised of the larvæ of *Ephemeridæ* and *Phryganeidæ* (Slater, 1901), the crab, *Cancer pulex*, *Nerita* and other small mollusks, as well as water plants (Faber, 1822); Hantzsch (1905) took from one stomach spindles and complete *Littorinæ*, larger crustaceans, as well as numerous complete eggs of a bone-fish, two millimeters in diameter.

In the Pribilov Islands the contents of eleven well-filled and eight nearly empty stomachs showed that the commonest foods in a region especially rich in invertebrate life were amphipods which were taken in the proportion of 51.4%. Hermit crabs composed 25.1% and mollusks 19%. The vegetable food was less than 1% and may very well have been taken accidentally (Preble and McAtee, 1923).

It seems that Harlequins, like Scoters and Eiders, are occasionally caught by large mussels or clams into whose open shells they have pushed their bills. L. M. Turner (1886) speaks of finding them drowned by mussels in Alaska.

They do not obtain all of their food by diving. In shallow streams they are often seen walking along on the bottom merely plunging their heads under rocks or between boulders. They can often be seen shoving themselves along on the bottom against a strong current with their feet alone in much the same manner as the Dipper (Johnstone, 1921). Their ability to take food under the strongest breakers has already been mentioned. In summer they feed in just as dangerous places, right under the foot of a waterfall where tons of white water fall from above, churned up by jagged rocks below (Millais, 1913).

COURTSHIP AND NESTING. The Harlequin always flies inland to clear swift-flowing mountain streams to nest. In Iceland they appear on the breeding grounds in late April and soon after go up-stream to the nesting places. In the Rocky Mountains and Alaska they do not arrive from the sea-coast until somewhat later. At Fort Chimo, Labrador, Turner (MS.) says they arrive by the 25th of May and then frequent the smaller fresh-water ponds and lakes. Later on, when the sea ice leaves they frequent the outlying islets and the rugged shores of the larger islands.

Toward the end of winter they assemble in larger flocks and it is then that the sex postures may best be seen. This display was first adequately described by Bretherton (1896) from birds seen on Kadiak Island: "In giving forth the call the head is thrown far back, with the bill pointing directly upwards and widely open; then with a jerk the head is thrown forward and downward, as the cry is uttered, and at the same time the wings are slightly expanded and drooped." Turner (MS.) speaks of several males squabbling over one female and describes the jealous males as extremely pugnacious, flapping through the water with surprising speed against the intruder and with open mouths uttering hissing sounds as they seize the offender by the body and, if he does not dive, pluck out a bill-full of feathers. Some writers speak of the sexes being equal in number on the breeding grounds, although, of course, the young do not mate until at least two years old. At Comox, on the coast of British Columbia, Allan Brooks (*in litt.*) noted that on the last day of March adult males were greatly in preponderance and no young birds had been seen for two months or more. As in the American Scoter these old males chased females about all winter, usually on the wing, five to nine males fluttering about after one female, sometimes seventy-five feet in the air.

In Iceland the eggs are found by the middle of June, sometimes, however, not until the first of July. One traveler went to Iceland to obtain eggs for hatching under hens and was told by the natives that almost all the Harlequins had hatched out before the 20th of June (C. B. Smith, 1908). This situation, if indeed it actually occurred, must have been very exceptional, for the species certainly nests much later than most ducks, perhaps by as much as three weeks (Slater, 1901).

Judging from the few actual nesting dates for the Rocky Mountain and Alaskan regions the laying season must average late, because many of the streams to which they resort are scarcely clear of ice and snow before mid-June. In the Rockies near Lake McDonald, Montana, I once saw a female with young unable to fly in late August and there are several other records of females with young scarcely grown, at the middle or end of that month.

It is extraordinary how few nests have actually been recorded from any locality outside of Iceland. In that happy resort of the duck tribe they are frequently found on small islands in rapid streams, in holes of the banks or under brush near the water. The Pearsons (1895) noticed that the nest was generally placed at a distance

of less than two yards from the water. On some small islands formed by the cutting through of a lava dam by a rapid stream, six nests with eggs were found. Three of them were only two feet from the rushing water under the leaves of wild angelica. The others were in holes in the bank near the water and sheltered by a screen of overhanging plants. Occasionally nests have been found ten to twenty yards from the water (Slater, 1901). In any case they are usually well concealed.

As to nesting sites in trees, second-hand observations were mentioned by Merriam (1883) for Newfoundland and by Shepard for Iceland (in Baird, Brewer and Ridgway, 1884). It seems very doubtful whether such localities are ever resorted to.

The nest itself is not characteristic, except for the gray down, which is coarser and larger than that of other Iceland ducks (H. J. and C. E. Pearson, 1895). The clutch is not particularly large, usually numbering from six to eight, and occasionally as many as ten. The eggs are yellowish white to rich cream-color and average 57.55 by 41.52 mm. In length they vary from 53.6 to 62.1 mm. and in breadth from 38.7 to 44.5 mm. (Hartert, 1920a). The incubation period has not been well determined, but it is surely a long one. It was estimated by Hantzsch (1905) at three and one half weeks which is evidently too short, while five weeks (C. B. Smith, 1908) is certainly far too long. Hugh Wormald hatched some eggs gathered in Iceland in the season of 1923. They were about three or three and a half weeks old when they arrived, rather fresher than various other Iceland duck eggs received at the same time, but they took just thirty-one days.

Toward the end of June the males begin to gather in flocks, but they do not all leave the vicinity of the nesting areas. Hantzsch (1905) found numbers of them on fresh water throughout the summer in Iceland and says they not infrequently rejoin the females and young when the latter go to the salt water in August or September. The females must moult their primaries very late in the summer or even in the autumn, for Allan Brooks writes me that in British Columbia he once shot a female with two full-grown young on their way to the coast on August 30. This particular female had not yet moulted her wing-feathers.

Old males in full eclipse were seen on the coasts of British Columbia toward the end of July, but they were still able to fly. These males, both on the coast and in the interior, become flightless in late August. One taken on September 3 had completely new wing-feathers, while most of the body plumage and the head was still in eclipse (A. Brooks, *in litt.*). The pre-eclipse and post-eclipse stages are irregular as to time in all ducks but they seem to be especially so in some of the sea ducks.

Status. In Iceland, since the game laws went into effect, there has apparently been a rapid increase, and the species is now spoken of as common. They were formerly shot by the Icelanders in both the open and the closed seasons (Slater, 1901; *et al.*).

For some reason there has been, in the last twenty to forty years, a very marked reduction on the Atlantic coast, particularly in Maine and Nova Scotia. Even on the north shore of the Gulf of St. Lawrence, Comeau (1909) notes that it has decreased rapidly and that in recent years it has been seen only in April and May. Langille (1884) remarked that in his time about Mud and Seal Islands, Nova Scotia, this species was still found in considerable numbers, sometimes as many as one hundred in a flock. Mr. Harry Piers, of the Provincial Museum in Halifax, writes me (1922) that at present the bird is only a rare winter resident. The last ones he saw were in April and November, 1917. Mr. Bonnycastle Dale, who has given much time to the study of flights of sea ducks along the Nova Scotian coasts, informs me that in three years' work along the shore from Liverpool to Yarmouth he has not seen a single individual. The species must at one time have been common in the Bay of Fundy for Dresser (1871–81) estimated one Harlequin to every twenty Longtails in winter.

In Maine several observers have noted a slow but steady decrease. Twenty or thirty years ago the taxidermists were constantly receiving specimens. Mr. M. Abbott Frazar, the well-known Boston taxidermist, tells me that he has seen almost none for twenty years and was surprised when, on December 5, 1922, he received a young male from Cape Cod. Farther south it is, and always has been, an extremely rare winter straggler. A pair was reported recently from Montauk Point, Long Island, New York (Griscom, 1922–23). The only individual I ever saw in Massachusetts was off the breakers at Chatham, in January, 1896 or 1897.

During the few years in which accurate and intensive bird study has been carried on along the North Pacific coast no particular diminution has been reported. It is certainly an abundant species from Puget Sound north to the Aleutians and Pribilovs. Flocks of more than one hundred have several times been recorded. Fortunately in all this region the Harlequin is little shot at during the winter, and its mountain breeding grounds are so far beyond the reach of civilization that the summer is spent in comparative safety.

Enemies. No specific notes are available.

Food Value. While feeding in fresh water the Harlequin is, like the Goldeneyes, a fairly good bird to eat. This applies particularly to young birds. After they have reached the ocean the flesh becomes strong, as in all other diving ducks that winter on the open sea. L. M. Turner (MS.) remarks that the flesh was very nice and tender, but had a fishy flavor that could be removed by drawing the bird soon after it was shot. Hantzsch (1908), writing of the same region (Ungava), reported that the flesh was esteemed, but no doubt epicures are rare in that region. Slater (1901), speaking of the nesting grounds in Iceland, went so far as to say that Harlequins were better than any duck of his acquaintance!

The eggs of this duck are regularly taken for food in Iceland along with those of many other species, but *intelligent* robbing of nests seldom if ever appears to affect the welfare of any duck.

Hunt. Attempts to shoot these ducks over decoys on the New England coast seem never to have been successful, but since their feeding grounds are frequently close to ledges or islands it is often an easy matter to creep down upon them unobserved and finally make a run to within range while they are under water. Most collectors have been able to get all they wanted in this way. As a rule they are a little too shy in winter to allow close approach by boat on the open sea.

Behavior in Captivity. Owing to its rarity and the difficulty of obtaining its eggs, very few attempts have been made to rear the Harlequin. In 1910, Mr. W. H. St. Quintin obtained several eggs from Iceland out of which one duckling hatched. This, a male, was successfully reared at Scampston Hall and lived until the summer of 1911. Mr. St. Quintin noticed that it always used its wings half opened when diving (Millais, 1913). In 1908, Mr. C. Barnby Smith went to Iceland to experiment with the eggs of Ptarmigans and Harlequins. He obtained some Harlequin eggs, but had to leave before they hatched. The native whom he left in charge failed to rear the birds beyond four days, as they refused all food. Hugh Wormald made an attempt in 1923 and succeeded in hatching three from eggs gathered in Iceland. The young lived only from one to five days and would not feed. However, Mr. Wormald told me that he learned enough of their requirements to make him feel sure that he would succeed the next time he tried.

Hybrids. None recorded.

GEOGRAPHICAL RACES

In 1915, W. S. Brooks noticed that the Harlequin Ducks which he collected in the North Pacific were larger and heavier than those from the Atlantic Coast and had a slightly different plumage-color. This race is a valid one although the differences in size and color are only slight.

ATLANTIC HARLEQUIN DUCK

HISTRIONICUS HISTRIONICUS HISTRIONICUS (Linné)

Anas histrionica Linné, Systema Naturæ, ed. 10, vol. 1, p. 127, 1758.
Histrionicus histrionicus Boucard, Cat. Avium, p. 60, 1876.

Characters: Size slightly smaller, especially in the bill, which is a little shorter (mostly under 26 mm. in length) and somewhat narrower and less deep. Chestnut stripes on sides of crown darker, white stripes between black of crown and the blue over the eye narrower and not extending much back of the eye.

Range: North Atlantic Coast, Greenland and Iceland.

WESTERN HARLEQUIN DUCK

HISTRIONICUS HISTRIONICUS PACIFICUS (Brooks)

Histrionicus histrionicus pacificus Brooks, Bull. Mus. Comp. Zoöl., vol. 59, p. 393, 1915.

Characters: Size slightly larger than birds from the eastern coast of America and from Iceland, especially in the bill, which is longer and heavier. Culmen of adult males up to 28 or 29 mm. in length and also wider and deeper in proportion. Wing 200–210 mm.; tarsus 38. The chestnut stripes on each side of the crown are distinctly paler and narrower. In most cases they do not extend so far forward as in Atlantic Coast specimens.

Range: All Pacific Coast specimens and also all breeding birds from the western United States and western Canada probably belong to this form. A specimen taken by F. Harper in the delta of the Athabasca River in 1920 also clearly belongs to this form. Females are not easily identified.

END OF VOLUME III